371997

U.S. EPA Superfund Program Proposed Plan

Crossley Farm
Huff's Church, Pennsylvania

EPA ANNOUNCES PROPOSED PLAN **July 23, 2001**

Dates to Remember:

July 23, 2001 to August 22, 2001 Public Comment Period on Alternatives in Proposed Plan.

August 7, 2001 7:00 PM Public Meeting Washington Township Elementary Route 100, Barto, PA

The United States Environmental Protection Agency ("EPA") has completed a Remedial Investigation and Feasibility Study (RI/FS) and is issuing this Proposed Remedial Action Plan ("Proposed Plan") to present EPA's Preferred Remedial Alternative for cleaning up contamination at the Crossley Farm Site ("Site") located in Huffs Church, Berks County, Pennsylvania. This Proposed Plan summarizes information obtained from the recently completed Remedial Investigation and Feasibility Study ("RI/FS"), and the technologies being considered for the cleanup of the Crossley Farm Site. The preferred alternative is to implement a limited area groundwater extraction and treatment remedial action for the highest concentration of contamination at the top of Blackhead Hill to achieve the Maximum Contaminant Levels (MCLs) allowed under the National Primary Drinking Water Regulations. This is an interim measure and if further described with more details on page 38. By using a limited number of extraction wells in the "hot spot" at the top of Blackhead Hill, the Agency can evaluate the effectiveness of a few wells to decrease concentrations in the groundwater and in the springs down the hill and in the valley. This interim remedial action is not a final decision on the regional groundwater cleanup. If extraction and treatment in the "hot spot" is successful, the proposed remedy can be expanded through a separate EPA decision document to become a larger network of extraction wells to remove more contaminated groundwater from the fractured bedrock The EPA is presenting this Proposed Plan to solicit public comment on the preferred alternative and the other alternatives for remediation of the contaminants present on the Site. EPA will select an interim remedy for the Site only after the public comment period has ended and the comments received during the comment period have been reviewed and considered. The interim remedy will be outlined in the Record of Decision ("ROD") for the Site. Based on new information and/or comments received, the remedy selected in the ROD may be different from the preferred alternative.

INSIDE:

This Proposed Plan is being issued as part of EPA's public participation requirements under Section 117(a) of the Comprehensive

Environmental Response, Compensation, and Liability Act of 1980, as amended ("CERCLA") commonly known as Superfund and Section 300.430(f)(2) of the National Contingency Plan. The public's comments will be considered and presented with discussion incorporated in the Responsiveness Summary contained in the ROD for the Site. This Proposed Plan summarizes information that can be found in greater detail in the RI/FS reports and other documents contained in the Administrative Record file for the Site. EPA encourages the public to review these documents in order to gain a more comprehensive understanding of the Site and the Superfund activities that have been conducted there. The locations of the Administrative Record file for the Site and the address to send comments on this Proposed Plan are given in this Proposed Plan.

I. SITE BACKGROUND

A. Site Location

The Crossley Farm Site is located in a rural area approximately 7 miles southwest of Allentown in the Huffs Church community of Hereford Township, Berks County, Pennsylvania. The site is located along the southern side of Huffs Church Road, approximately 3 miles west-northwest of State Route 100 and northwest of the borough of Bally. The Site location is shown on Figure 1.

The Site is located in the Reading Prong Physiographic Province. The topography reflects the complex underlying bedrock geology and consists of high hills and ridges underlain by bedrock. The most prominent highland within the study area occurs at the Site and is known locally as Blackhead Hill. The hill is very steeply sloped to the west and south of its crest. To the north and east of its crest, the hill is fairly level or flat and supports a working farm over much of its area. The crest of Blackhead Hill is underlain by the Hardyston Quartzite, which makes an attractive building stone. A small quarry at the crest of the hill has had some limited activity for nearly 50 years.

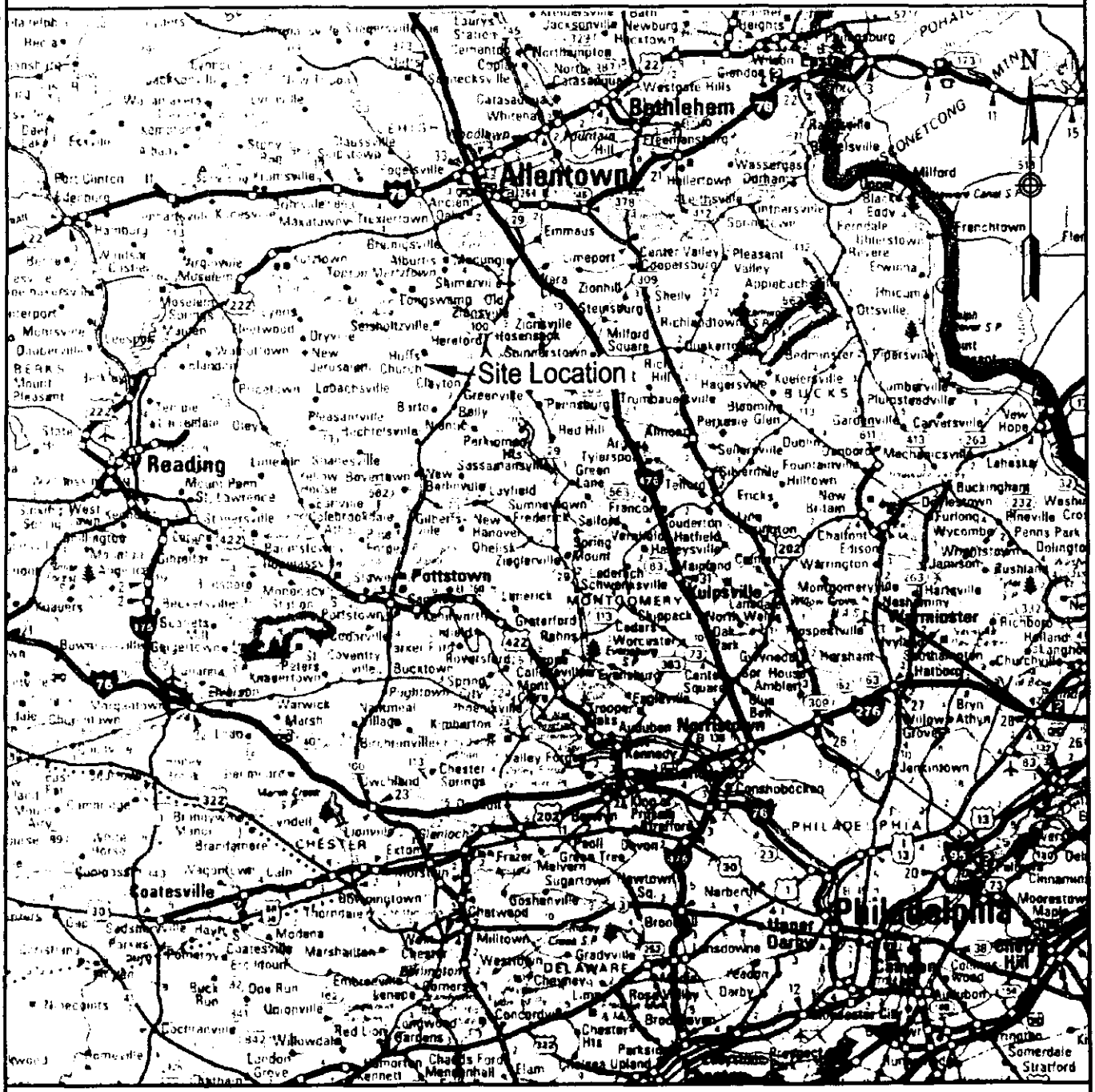
B. Site History

From the mid-1960s to the mid-1970s, a local plant, Bally Case and Cooler Inc. now known as Temrac Company Inc, reportedly sent numerous drums to the Crossley Farm for disposal. These drums contained mostly liquid waste and were described as having a distinctive "solvent" odor. The plant was believed to have used trichloroethene (TCE) as a degreaser from at least the mid-1960s until 1973 and tetracholorethene (PCE) from at least the early 1960s until 1980. EPA is currently preparing for a cost recovery action against the potentially responsible parties involved at the Site and future actions with the Department of Justice are expected;

Known and alleged waste disposal areas include a trash dump, the quarry, the borrow pit area, an alleged drum disposal area and the EPIC pit area. All of these suspected source areas were investigated and are further described in the Remedial Investigation report and Feasibility Study Report (RI/FS).

State involvement at this Site began in 1983, when local residents complained to the Pennsylvania Department of Environmental Protection (PADEP) about odors in private water supply wells. A PADEP sampling program of local wells conducted in September 1983 revealed concentrations of TCE as high as 8,500 micrograms/liter (ug/L) and PCE as high as 110 ug/L. The Maximum Contaminant Levels (MCLs) for TCE and PCE established under the Safe Drinking Water Act are 5 ug/L for both compounds. A subsequent sampling round conducted by PADEP and EPA in November 1983 revealed that eight home wells contained detectable levels of TCE, and in six of these wells the concentrations of TCE exceeded 200 ug/L.

1340\7525bm09A.dwg 6/15/01 LDL



0 6 12

SCALE IN MILES

SITE LOCATION MAP

CROSSLEY FARM

HEREFORD TOWNSHIP, BERKS COUNTY, PA

FIGURE 1

1340-7525bm09.Adwg

AR302214

As a result of the November 1983 sampling, PADEP issued a health advisory on groundwater use in the area and recommended either boiling water, installing carbon filtration systems, or using bottled water where TCE concentrations exceeded 45 ug/L. Shortly thereafter, a temporary water supply was provided by the Pennsylvania National Guard through the Pennsylvania Emergency Management Agency. This supply was terminated in mid-1985.

After the health advisory was issued, local residents began to voice concerns about Crossley Farm and alleged dumping of wastes there. In response to these concerns, EPA conducted a preliminary assessment (PA) of the property. The PA, completed in June 1984, concluded that insufficient information existed to identify the source of the groundwater contamination and suggested that a regional groundwater study be conducted.

Further citizen complaints in August 1986 prompted additional sampling of residential wells by EPA in September 1986. TCE levels detected during these rounds ranged up to 19,000 ug/L. Additional well sampling in November 1986 detected TCE at a maximum level of 22,857 ug/L.

EPA initiated an emergency response in December 1986 and, in January 1987, EPA began installing carbon filtration units on the most severely impacted private wells. A contaminant concentration level of 180 ug/L of TCE or greater was used as the criterion for installing a filter for any particular well. This criterion was developed in consultation with the Agency for Toxic Substances and Disease Registry (ATSDR) and was based on one-half of the Drinking Water Equivalent Level (DWEL). At that time15 carbon filter units were installed and maintained by EPA.

In the spring of 1987, EPA initiated a regional hydrogeological investigation to include the installation and sampling of on-site and off-site monitoring wells and the sampling of residential well supplies. This investigation, completed in August 1988, concluded that the source of the TCE in the groundwater was near the crest of Blackhead Hill. The abandoned quarry and the borrow pit area were cited as the presumed source areas. The investigation delineated a contaminated groundwater plume extending approximately 7,000 feet downgradient from Blackhead Hill and along Dale Road.

Concurrent with and independent of the EPA study, residential wells near Dale Road were sampled and analyzed for polychlorinated biphenyls (PCBs) and other contaminants as part of a PADEP investigation of the Texas Eastern - Bechtelsville compressor station. One residential well located on Forgedale Road contained TCE at levels greater than 200 ug/L, suggesting that the TCE plume associated with the Crossley Farm Site extended even farther to the south than mapped, since TCE was determined not to be a common waste product from compressor station operations. This result prompted additional sampling by EPA along Forgedale Road, south to Old Route 100, as part of the Crossley Farm investigation. These analytical data indicated that the plume extended south of the compressor station and Forgedale Road and about 9,000 feet downgradient from Blackhead Hill.

In February 1991, EPA issued the final Hazard Ranking System (HRS) package for the Crossley Farm Site in preparation for the Site's proposal for the National Priorities List (NPL). In July 1991, the site was proposed for the NPL. The Site was formally listed on the NPL in October, 1992.

In September 1994, EPA initiated a remedial investigation and feasibility study (RI/FS) for the Site to evaluate existing data, collect additional data as necessary and consider appropriate actions. EPA decided to expedite evaluation of alternatives to address the contaminated residential well supply problem by preparing a focused feasibility study (FFS) prior to completion of the remaining Site

investigation activities.

In June 1997, EPA signed a Record of Decision to provide point of entry carbon treatment units for all residential drinking water wells that showed contamination related to the Site. This was considered the first operable unit (OU1) for the remedial action at the Site. EPA's subcontractor S&G Water Conditioning, began the installations in September 1999. To date, EPA has installed a total of approximately forty-three carbon treatment systems in area homes impacted by the Site contamination.

The remedial action for OU1 is complete and PADEP has assumed the responsibility for maintaining these systems beginning in February 2001. EPA will continue to sample drinking water wells in the area of the Site, every six months, to determine whether any new homes require a carbon treatment system

In the summer of 1998, EPA's Emergency Response Team excavated approximately 1200 drums and 15,000 tons of contaminated soil from the location identified as the Epic Pit Area. All the materials were disposed at approved and permitted hazardous waste disposal facilities.

The field activities continued through 1999 and the RI/FS reports were completed July 2001.

C. Site Ownership and Use

The current owner of the site is a general partnership named Crossley Brothers Farms. The partnership is comprised of six tracts of land, totaling 318 acres, approximately 209 of which is now known as the Crossley Farm Superfund Site. The Site has been operated as a dairy farm since 1927, either by members of the Crossley family, or by the local farmer currently renting the Site property. There has never been a permitted hazardous waste facility at the Site and no regulatory permits have ever been issued for the Crossley Brother Farms partnership.

II. Remedial Investigation (RI) Results

A. Objectives

The objectives of the RI/FS for the Crossley Farm Site were

1. To characterize the nature and extent of Site-related contamination in the groundwater, surface water, sediments and soil.

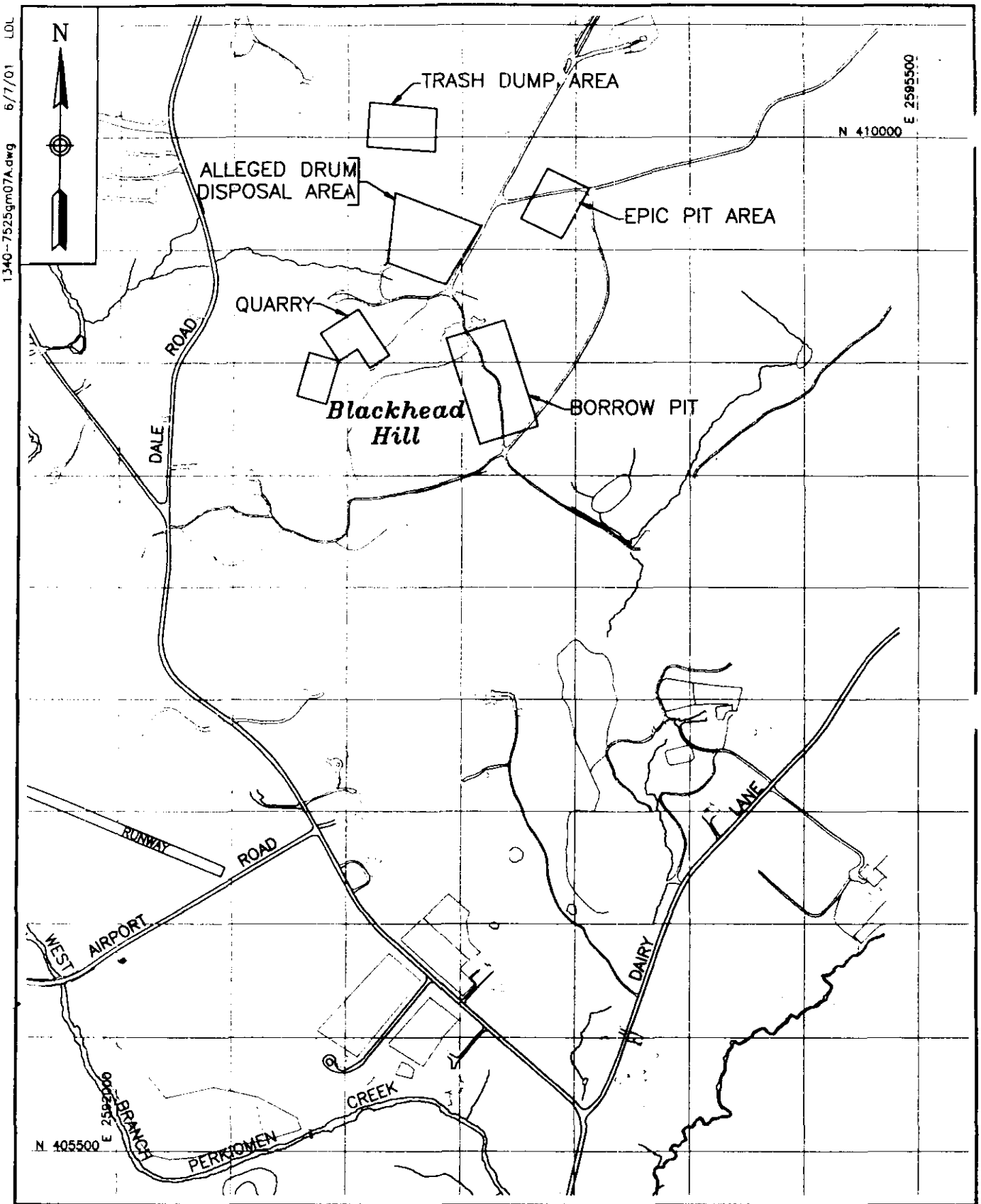
2. To collect the necessary data to complete a comprehensive assessment of the actual and potential health and environmental risks associated with the Site.

3. To obtain the information necessary to develop and evaluate remedial alternatives.

B. Site description

The Remedial Investigation field activities for the Site began in October 1996. The initial area for the investigation was the actual farm property located on the top of Blackhead Hill on the southern side of Huff's Church Road. The files identified several potential source areas. Each of these areas has been named and identified on the Site map Figure 2.

The Trash Dump "Dump"consists of mainly household and farm related trash.



POTENTIAL SOURCE AREAS

CROSSLEY FARM

HEREFORD TOWNSHIP, BERKS COUNTY, PA

FIGURE 2

1340-7525gm07A.dwg 6/7/01 LDL

1340-7525gm07A.dwg

AR302217

The Quarry is on the crest of Blackhead Hill and was previously cut and blasted to break up the boulders and fractured bedrock onto smaller stones used for building materials. It is suspected that unregulated disposal of solvent waste liquids were poured over the exposed rock and migrated quickly into the fractured bedrock aquifer.

The Borrow Pit Area is located on the eastern side of the quarry and approximately 8 -12 feet of soil was excavated to the top of the bedrock. It is suspected that the borrow pit area was previously used as a staging / storage area for drums of waste material.

The Alleged Drum Disposal Area is a portion of the farm field that had been identified by previous discussion with local residents as the location of buried drums. However, based on the Remedial Investigation this area is not a source area and no drums were found.

The EPIC Pit Area was identified by a 1980 aerial photograph which noted possible disposal activity. At the beginning of the field investigation, this area was utilized for crops the same manner as the other open areas of the farm. During the geophysical investigation and soil gas investigation, the EPIC Pit Area was identified as the actual location of the buried drums. EPA prepared an Action Memorandum and the pit was excavated by the Emergency Response Team in the summer of 1998 resulting in the removal of approximately 1200 drums and 15,000 tons of contaminated soil.

In addition to the farm property on the top of Black head Hill, the Remedial Investigation expanded the Crossley Farm Site to include the groundwater originating at the top of the hill and flowing in a southerly direction down the valley towards Dale Road, Dairy Lane and then towards Forge Dale Road. The groundwater investigation identified contamination from the industrial solvents trichloroethene (TCE) and tetrachloroethene (PCE). Contamination has been detected in residential home wells and monitoring wells at various depths. The contaminated groundwater plume extends almost 3 miles down the valley from Blackhead Hill.

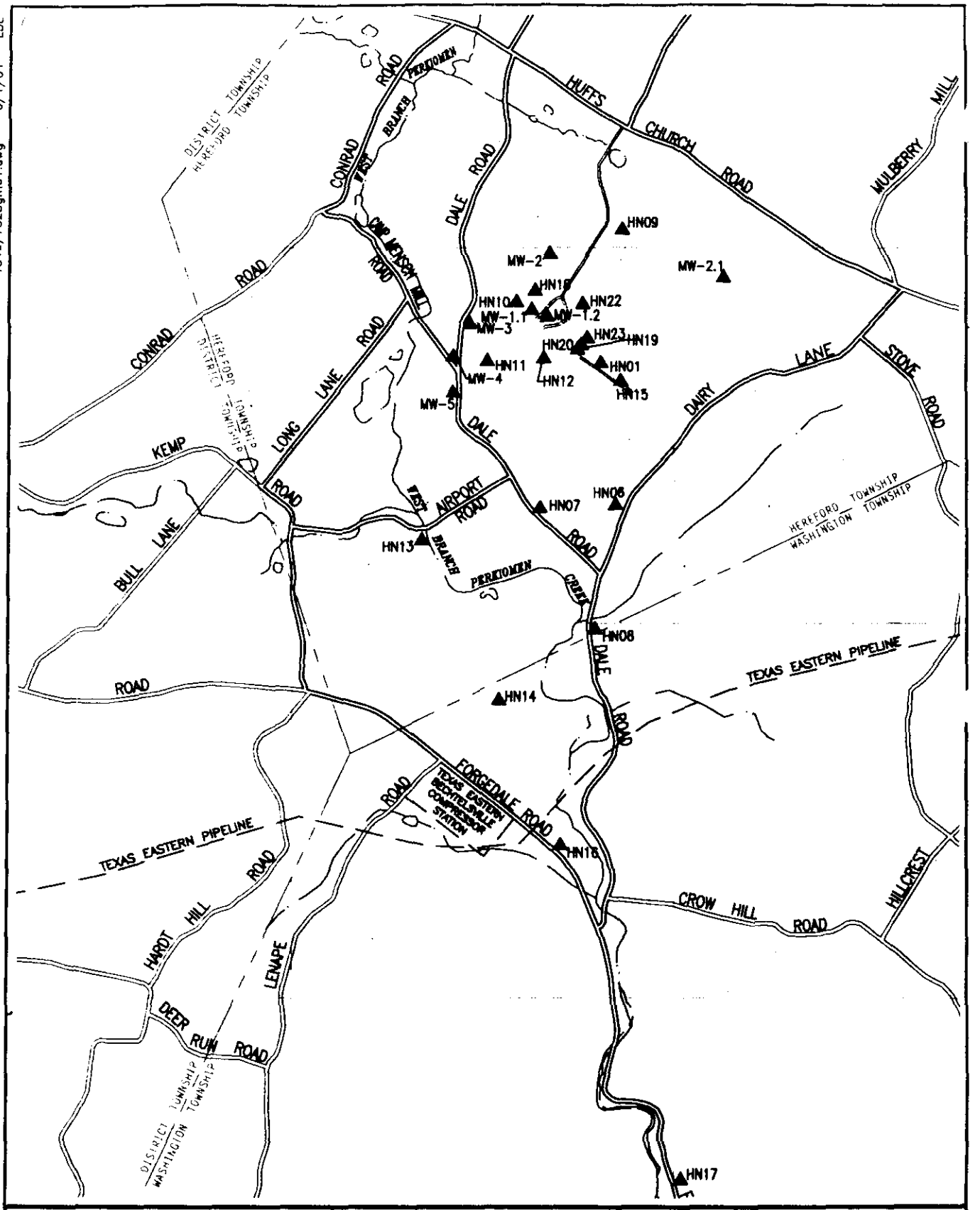
C. Groundwater

A total of 39 monitoring wells were installed during the field investigation to delineate the nature and extent of contamination associated with the Site. The wells were located on the farm property at the top of Blackhead Hill as well as down the hill adjacent to the farm and also down the valley along Dale Road, Airport Road and Forge Dale Road. The locations are shown on Figure 3. Each location has one or more wells in clusters to provide samples at different depths.

The RI report shows concentrations of TCE at three depths; shallow (approximately 40 - 70 feet deep), intermediate (100 - 150 feet deep) and deep (200 - 400 feet deep). Each map shows color contours indicating concentrations in micrograms per liter (ug/l) which is the standard unit for laboratory analysis of water samples. One ug/l is equivalent to one part per billion or 1ppb.

The maps range from 10 ug/l (10^1) up to 100,000 ug/l (10^5). The highest concentration was 190,000 ug/l at well HN-23 which is located at the top of the hill in the Borrow Pit Area. This is a very high concentration. For reference, the drinking water standard is only 5 ug/l. It is suspected that the TCE may still be in pure product form which is referred to as a Dense NonAqueous Phase Liquid ("DNAPL").

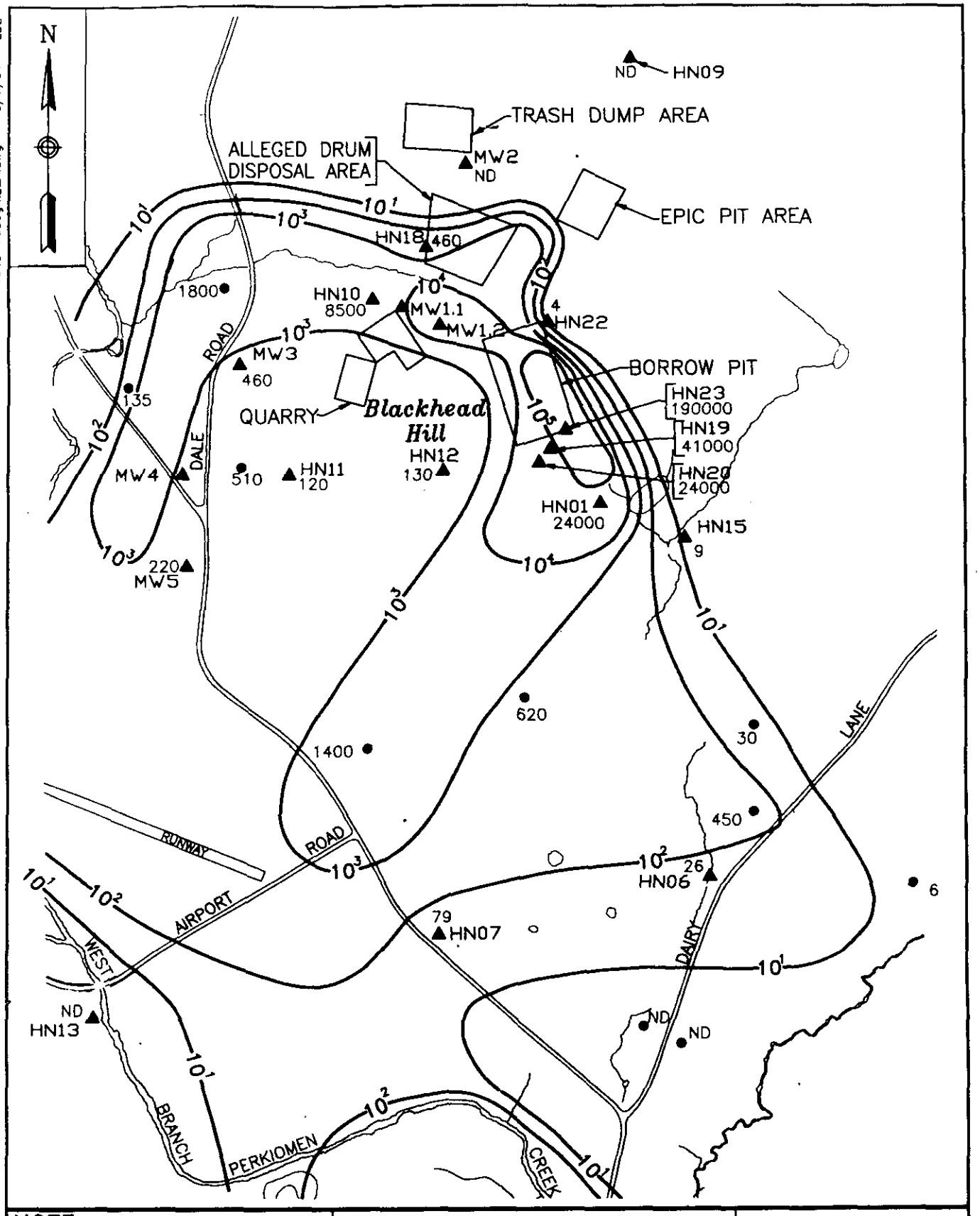
Figure 4 shows the data for TCE concentrations in groundwater from the



LOCATIONS OF MONITORING WELL CLUSTERS AT CROSSLEY FARM HEREFORD TOWNSHIP, BERKS COUNTY, PA

FIGURE 3

1340\7525gm01.dwg



NOTE:
TCE CONCENTRATIONS REPORTED IN ug/L.

0 600 1200
SCALE IN FEET

TCE CONCENTRATIONS IN INTERMEDIATE GROUNDWATER

CROSSLEY FARM
HEREFORD TOWNSHIP, BERKS COUNTY, PA

FIGURE 4

1340-7525gm22A.dwg 6/7/01 LDL

1340-7525gm22A.dwg

AR302220

intermediate depth at the top of the hill and Figure 5 illustrates TCE concentrations in the deeper groundwater zone for the entire valley plume.

The groundwater sampling and analysis for the inorganic compounds indicates that a number of naturally occurring metals were detected throughout the study area. The only ones which have been identified in the baseline risk assessment are lead, iron and manganese because the concentrations in the center of the plume area exceed the Region III risk based concentrations (RBCs). The lead is attributable to the local geology and not from any disposal activities. The manganese and iron are also attributed to the local geology, but they can be leached from the soils and rock due to the contamination in the groundwater and would be considered attributable to the Site.

D. Surface Water and Springs

As shown in Figure 6, a total of 21 locations were sampled for the RI field activities. The results indicate that the contamination is fairly widespread throughout the study area. This is a result of the shallow groundwater discharge through springs to surface water and the general flow toward the West Branch of the Perkiomen Creek.

The highest concentrations found were located at four spring locations; SW-11, SW-10, SW-13 and SW-15. Based on the latest sampling information, these springs are discharging groundwater at concentrations around 200 ug/l of TCE.

The samples taken from the creek locations show a decrease in concentration to around 10 - 20 ug/l because of the dilution when entering the larger flow volume in the creek.

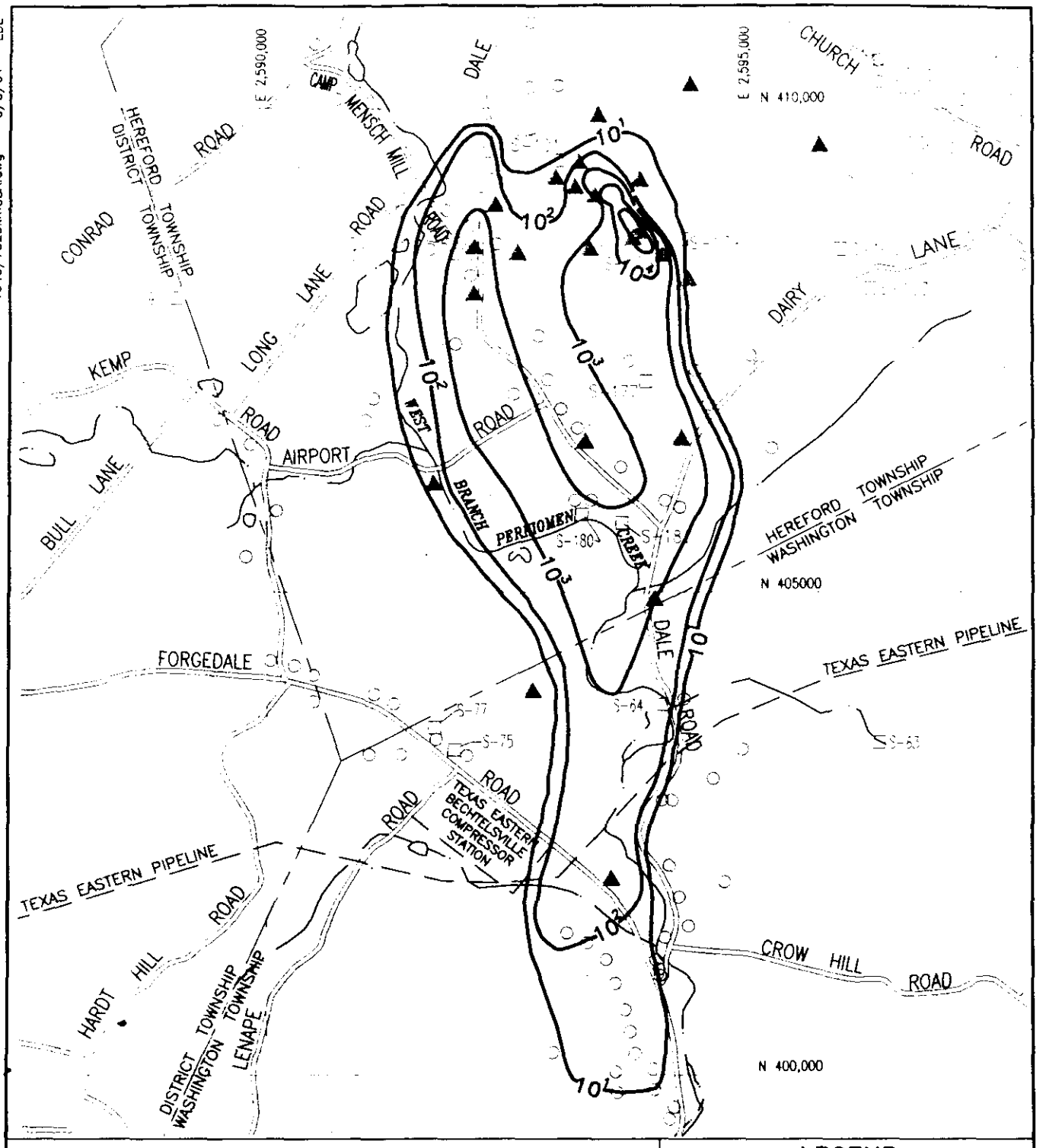
There is a very positive finding in the results over time in the hottest spring SW-11. When the Round 1 sample was taken in 1997, the concentration of TCE was over 2000 ug/l. By the June 2000 Round 4 sampling the concentration decreased to around 200 ug/l. This decrease appears to be directly attributable to the Removal Action taken in 1998 where over 1200 drums and contaminated soil was excavated from the EPIC Pit Area that is directly upgradient from spring SW-11.

The inorganic analysis for the surface water throughout the study area includes aluminum, arsenic, barium, iron, manganese, thallium, beryllium, cyanide, chromium, lead and zinc. Because minerals are a natural component of surface water, the RI attempted to determine if any of these metals could be attributed to the Site. The RI indicated that the only metal that may be attributed to the site because it appears in three of the springs immediately downgradient of the disposal area is cyanide. However the levels do not generate a risk to the public or the environment.

E. Sediments

Overall the nature and extent of the VOC contaminants within the sediments is very similar to the results for surface water. The springs at SD-11 and SD-10 present the highest concentration of TCE at 6240 ug/kg and 116 ug/kg respectively. The springs at SD-13 and SD-15 are lower less than 5 mg/kg. One sample taken at SD-8 indicates concentration of TCE at 86 mg/kg which was higher than expected based on the surface water sample results.

Four sampling locations (SD-2, SD-8, SD-10 and SD-12) contain the maximum inorganic concentrations of iron, manganese, aluminum, arsenic, nickle, thallium and zinc. The majority of the metals found in sediment are naturally occurring and ubiquitous throughout the Site.



NOTE:

TCE CONCENTRATIONS REPORTED IN µg/L.

LEGEND

▲ = MONITORING WELL LOCATION

○ = RESIDENTIAL WELL LOCATION

0 1500 3000

SCALE IN FEET

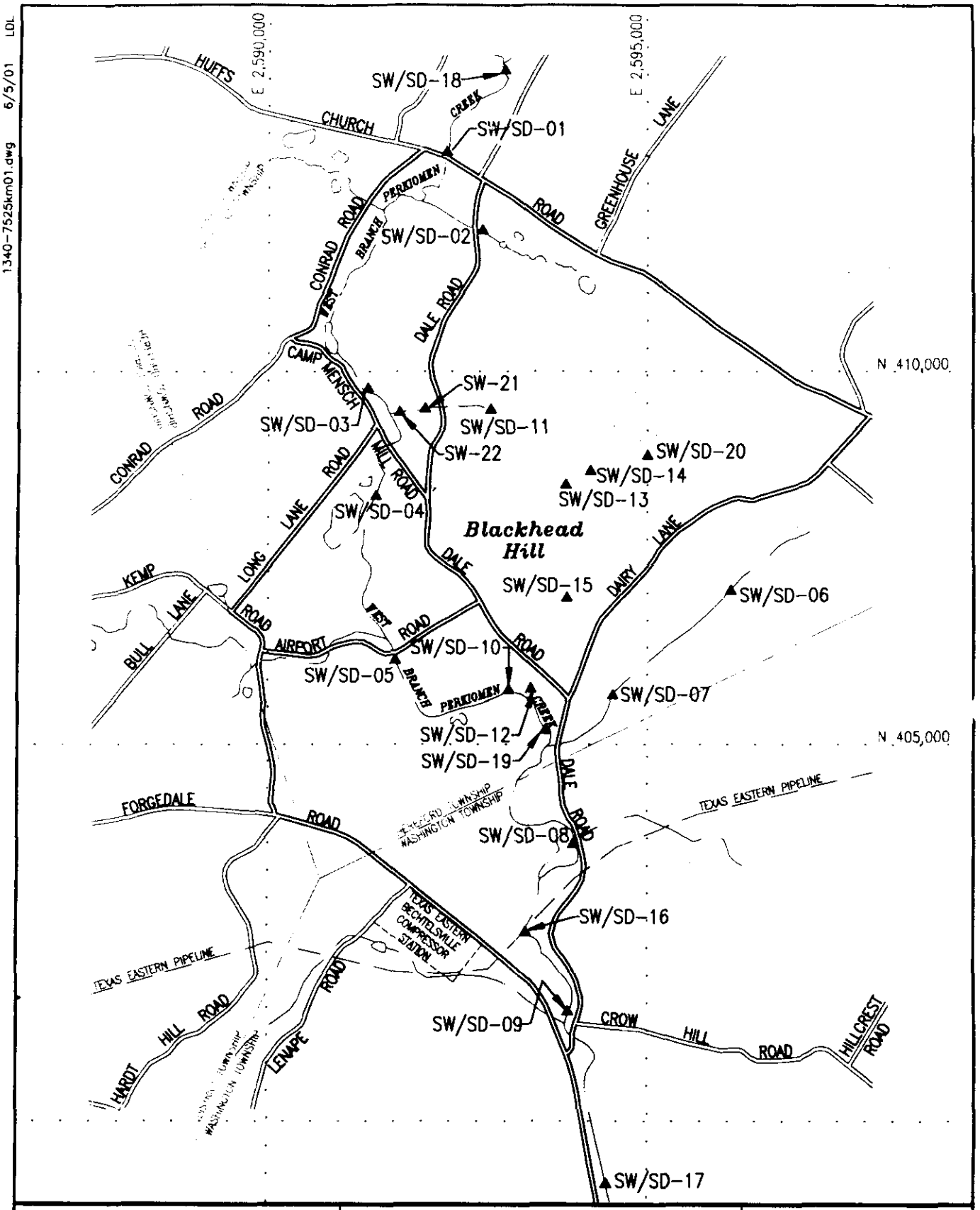
TCE CONCENTRATIONS IN DEEP GROUNDWATER

CROSSLEY FARM

HEREFORD TOWNSHIP, BERKS COUNTY, PA

FIGURE 5

1340\7525km08A.dwg



0 1800 3600

SCALE IN FEET

SURFACE WATER & SEDIMENT SAMPLING LOCATIONS

CROSSLEY FARM SITE

HEREFORD TOWNSHIP, BERKS COUNTY, PA

FIGURE 6

1340-7525km01.dwg 6/5/01 LDL

1340-75 21.dwg

AR302223

F. Soil

The soils evaluation was subdivided into three categories and the results are presented in the RI Section 4 for the surface soil, the subsurface soil and the test pit (Trash Dump) location. Figure 7 shows the location of the source investigation areas.

Volatile organics, specifically TCE, were only detected in two samples near the Borrow Pit. Both concentrations were below 10 ug/kg. This supports the assumption that the area was used for a previous disposal , but the low concentrations found indicate that the bulk of the contaminated soil was removed and that whatever small amount of contaminated soil that remains would not be a residual source of contamination for the underlying groundwater in the bedrock at concentrations of 190,000 ug/l.

There was also one detection of TCE in the Trash Dump area at 18 ug/kg which appears to be an isolated occurrence and only in small quantities. The dump is also not considered a major contributor to the contaminated groundwater plume.

The inorganic analysis for soil indicated that the metals of concern included aluminum, chromium, iron, manganese and vanadium for the surface and subsurface soils. Analysis of the Trash Dump area revealed these same metals plus arsenic and thallium. These metals occur naturally and the distribution throughout the Site do not support the conclusion that any elevated concentrations were a result of unregulated disposal of hazardous waste solvents at the Site.

One type of PCB was detected at three different locations in soil on the farm. Aroclor - 1260 was detected near the Trash Dump, the Borrow Pit and the Quarry Area. The concentrations ranged from 40 ug/kg to 1000 ug/kg.

G. Residential Well Sampling

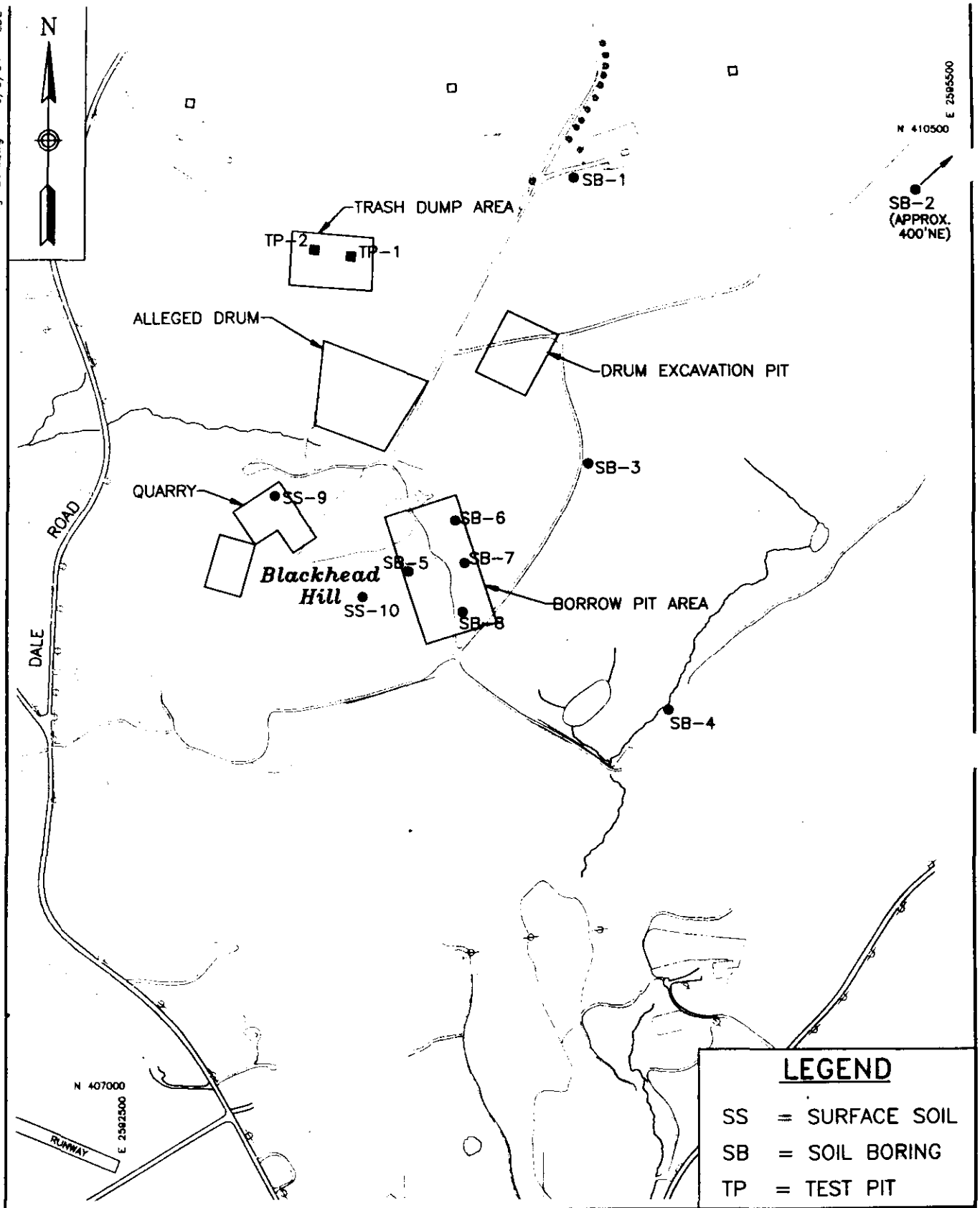
Figure 8 shows the large area covered by the residential well sampling. The results of the first five rounds of sampling are provided in Appendix H in Volume II of the RI report. EPA has monitored the individual wells and springs over the past four years and the homeowner's results were sent directly to the resident. Only well numbers were used to identify samples in Appendix H to protect the identity of homeowners. EPA will continue to sample drinking water wells in the area of the Site, every six months, to determine whether any new homes require a carbon treatment system.

The current point of entry treatment systems established as the interim remedy for drinking water in OU 1 will remain in effect and will not be changed by this proposed remedy for the groundwater remedial action. EPA will continue to monitor the individual wells and springs as outlined in the 1997 Record of Decision for OU 1.

III. SCOPE AND ROLE OF RESPONSE ACTION

As discussed in the Site History section, the Crossley Farm Site has been known to have groundwater contamination since the early 1980's. EPA's initial actions provided carbon filtration units for a limited number of homeowners and began the regional groundwater investigation. Following the addition of the Site to the National Priorities List, the Agency began to work plan and field activities which lead to the discovery of the buried drums in the Epic Pit area. EPA mobilized a response action to remove the drums and contaminated soil which was one of the source areas for groundwater contamination.

At the same time EPA decided to review the analytical results from all the residential



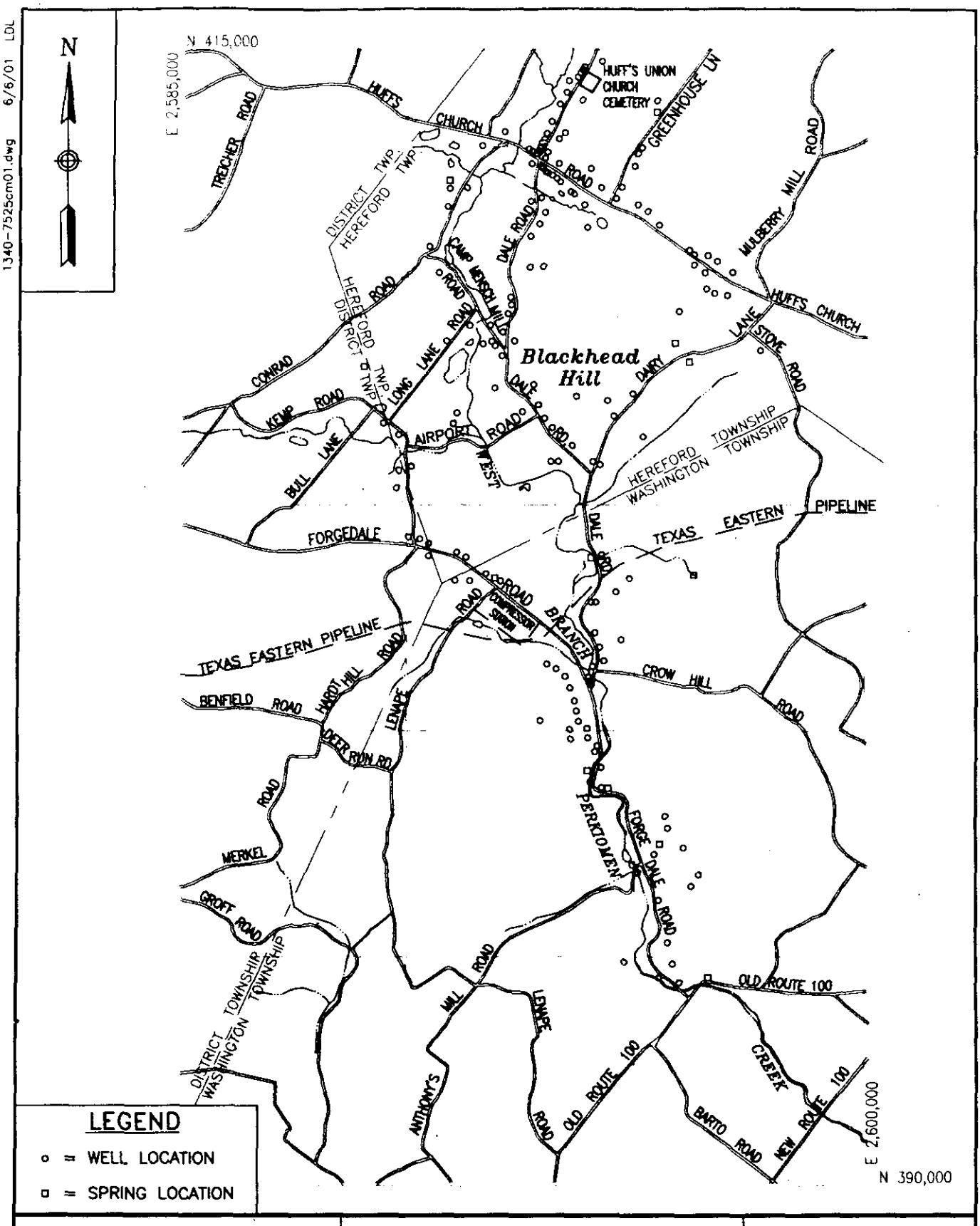
SOIL SAMPLE LOCATION MAP

CROSSLEY FARM

HEREFORD TOWNSHIP, BERKS COUNTY, PA

FIGURE 7

525gm20A.dwg



LOCATIONS OF
RESIDENTIAL WELLS & SPRINGS
AT
CROSSLEY FARM
HEREFORD TOWNSHIP, BERKS COUNTY, PA

FIGURE 8

1340-7525cm01.dwg 6/6/01 LDL

1340-7525cm01.dwg

AR302226

drinking water wells and to provide carbon filtrations to all homeowners who had contaminants in their water related to the Site contamination. These units have been installed by EPA and are now maintained by PADEP.

This proposed plan presents the information necessary to inform the public of the existing contamination at the site and the proposed clean up alternative for the groundwater operable unit.

This remedy is proposed as an interim action to begin the massive and complex task of cleaning up the groundwater contamination problem originating at the top of Blackhead Hill with concentrations as high as 190,000 ug/l. This action will address only the "hot spot" located in the borrow pit area and will be used to measure and define the ability of a groundwater extraction and treatment system to reduce the highest concentration.

This interim remedial action is not a final decision on the regional groundwater cleanup. If extraction and treatment in the "hot spot" is successful in reducing concentrations at the top of the hill and in the springs located on the hill and in the valley, the proposed remedy can be expanded through a separate EPA decision document to become a larger network of extraction wells to remove more contaminated groundwater from the fractured bedrock.

This remedial action is only for groundwater. The evaluation of the soil did not show remaining soil concentrations which would impact the already contaminated groundwater. The evaluation of surface water shows elevated concentration in the discharge of several springs, but the treatment of groundwater should reduce the concentration in the springs. The sediment evaluation did not show any excessive risks for human health or wildlife in the vicinity of the site.

This proposed remedy will be for a second operable unit (OU2) to treat groundwater. The first operable unit for point of entry treatment to residential drinking water supplies at the residence will remain in effect. .

IV. SUMMARY OF SITE RISKS

A. Baseline Human Health Risk Assessment

The **Risk Assessment ("RA")** performed during the RI/FS identified groundwater contamination beneath and beyond the boundaries of the Site as posing an unacceptable level of risk.

The **National Contingency Plan ("NCP"),** 40 **CFR** Part 300, establishes a range of acceptable levels of carcinogenic risk for Superfund sites that range between one in 10,000 and one in 1 million additional cancer cases if cleanup action is not taken at a site. Expressed in **scientific notation**, this translates to an acceptable risk range of between 1E-04 (1 X 10-4) and 1E-06 (1 X 10^{-6}) over a defined period of exposure to site related contaminants.

In addition to carcinogenic risk, chemical contaminants that are ingested, inhaled or dermally absorbed may present non-carcinogenic risks to different organs of the human body. The non-carcinogenic risks or toxic effect are expressed as a **Hazard Index ("HI")**. EPA considers a HI exceeding one to be an unacceptable non-carcinogenic risk.

The RA studies the carcinogenic and non-carcinogenic, current and future risks at the Site based on the levels of contaminants found during the RI and reasonable risks were calculated based on chemicals of potential concern ("COPCs") from

groundwater, surface water, sediments and soil. The risk assessment also evaluated the pathway which could lead to exposure for people such as drinking the water, wading or swimming in the springs, eating fish, direct contact or ingestion of the soil and the possibility of an agricultural pathway. The possible human receptors include current and future resident scenarios for children and adults, recreational exposure, and industrial worker and a construction worker.

The risk assessment chapter presents a great description of the details used for the calculations for each of these scenarios, but the most critical information for this proposed plan is based on the summary of combined risks from all exposure pathways for the resident child, resident adult and the lifetime resident.

For a resident child, resident adult and lifetime resident the Reasonable Maximum Exposure (RME) carcinogenic risks were significantly greater than 1×10^{-4} based upon contributions from groundwater but risks from other pathways (soil, sediment, and surface water) were less than 1×10^{-4}.

For the residential child, groundwater ingestion was 54 percent of combined cancer risk and dermal contact with groundwater was 46 percent. For the residential adult, groundwater ingestion was 55 percent of combined cancer risk and inhalation during showering with groundwater was 45 percent. For the lifetime resident, groundwater ingestion was 55 percent of combined cancer risk, dermal contact with groundwater was 19 percent and inhalation during showering was 26 percent.

Maximum noncancer risk for the residential child and residential adult were driven by several contaminants in groundwater including volatile organic compounds and iron HIs up to 1030 for groundwater ingestion and HIs up to 1320 for dermal contact for the residential child, and HIs up to 631 for inhalation of vapors during showering and HIs up to 378 for groundwater ingestion for the residential adult. In addition, maximum risks were significant due to contact with test pit soil (around and under the trash dump). Iron in soil contributed the most to an HI 2.37 for a residential child. Swimming and wading exposures to TCE in surface water at SW10 (see figure 6) were also significant, with respective HIs of 3.3 and 1.7 for the residential child and 2.0 and 1.0 for the residential adult.

The maximum risks for exposure to all media for the resident child, resident adult and lifetime resident are show on the following Table 1.

TABLE 1

	Risk Type:	NON-CANCER RISK		CANCER RISK
	Receptor:	CHILD	ADULT	LIFETIME RESIDENT
MEDIA	Reference:	Table 10.5 RME	Table 10.6 RME	Table 10.7 RME
Groundwater		2.35E+03	1.01E+03	4.95E-02
Sediment		2.00E-01	8.39E-02	7.06E-07
Surface Water		5.34E+00	3.03E+00	1.21E-04
Test Pit Soil		2.40E+00	6.04E-01	4.53E-05
All Exposure Routes		2.36E+03	1.01E+03	4.97E-02

B. Ecological Risk Assessment

The ecological risk assessment for the RI and the food chain modeling suggest that the concentration of certain contaminants at the Crossley Farm Site may be adversely affecting some of the more sensitive receptors, especially those receptors that are relatively immobile and spend extended periods of time in one of the locations that has a significant concentration of contaminants.

It is significant that the concentration of TCE and other volatile compounds in the springs present only a localized effect and that even though the number of sediment dwelling organisms may have been impacted at these spring locations, the number of other springs in the wetlands and local vicinity still provide available locations for the local predator populations.

There is also one location, SD-18, where the concentrations of aluminum presented a concern when evaluating the food chain pathway for wildlife that consumes a number of insects and soil invertebrates. However the effects are localized and would not be present over the entire site area and down the valley. Furthermore, aluminum is a naturally occurring metal and not related to any hazardous waste disposal at the Site, based on EPA's information to date.

C. Basis for Taking Action

It is the lead agency's current judgement that the Preferred Alternative identified in this Proposed Plan, or one of the other measures considered in this Proposed Plan, is necessary to protect public health or welfare or the environment from actual or threatened releases of pollutants or contaminants from the site which may present an imminent and substantial endangerment to public health or welfare.

D. Remedial Action Objectives

The primary objectives for this groundwater operable unit are to contain the contamination in the fractured bedrock aquifer at the Site and to reduce the contamination in the aquifer and the surface water springs to MCL's or below.

This objective is consistent with the past actions of providing carbon filtration units to affected residents to protect their health and welfare and the previous removal of identified source areas at the Site.

V. SUMMARY OF REMEDIAL ALTERNATIVES FOR GROUNDWATER

Alternative 1 - No Action

Under this alternative, no measures would be taken to contain and / or treat the contaminated groundwater plume. The source area on the top of Black Head Hill would continue to migrate in the groundwater and continue to discharge at spring locations and flow into the surface water of the Perkiomen Creek.

No restrictions on current or future use of groundwater would be made.

As required by CERCLA a review of Site conditions would be conducted every five years because contaminants would remain in groundwater beneath the Site.

Capital O & M and Present Worth Costs $0

Alternative 2 - Institutional Controls and Groundwater Monitoring

The institutional controls would be to monitor the groundwater and restrict the use of contaminated groundwater at the Site.

Groundwater extraction wells shall not be installed and contaminated groundwater at the Crossley Farm Superfund Site, including but not limited to the areas of Huff's Church Road, Dale Road, Forgedale Road, Dairy Lane, Airport Road and Camp Mench Mill Road shall not be used unless treatment units are installed and maintained to ensure that any water used has contaminant levels at or below MCLs. This could be achieved with local government restrictions on the use of groundwater.

Because the June 1997 ROD is now complete, as discussed above, any new property construction over the contaminated groundwater plume after February 2001 would not receive carbon filtration units paid for by EPA.

Groundwater monitoring under this alternative would be a remedial action. Sampling of residential wells and springs would be conducted every 6 months.

As required by CERCLA a review of Site conditions would be conducted every five years because contaminants would remain in groundwater beneath the Site.

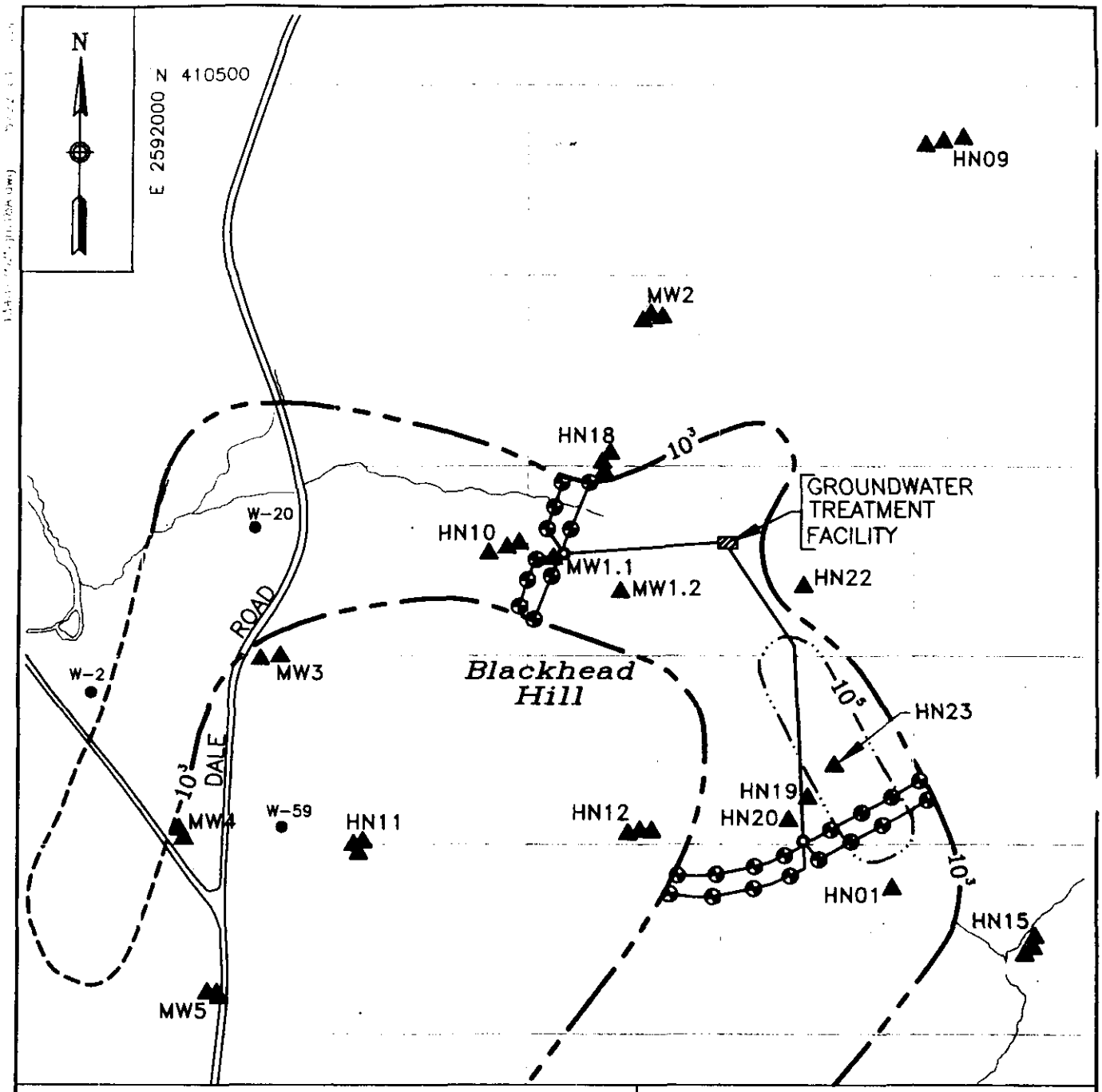
Capital costs	$ 16,074
O & M Costs	$ 21,900
Present Worth Costs	$581,148

Alternative No. 3- Groundwater Containment of Center of Plume and on-Site Treatment / Recharge

This alternative would require construction of a groundwater extraction well system on the top of Blackhead Hill to contain the area of concentrations for TCE greater than 1000 ug/l.

This alternative would need additional design investigations to determine the exact locations and number of extraction wells to achieve containment in the complex fractured bedrock.

Figure 9 shows a conceptual drawing of how the alternative could be constructed. The extraction wells are located on the western and southern edges of the borrow



NOTES:

1. ISOPLETHS ARE FOR TCE IN THE INTERMEDIATE AQUIFER.
2. THIS IS A PRELIMINARY CONCEPTUAL DESIGN.

LEGEND

- EXTRACTION WELL
- DOUBLE WALL PVC PIPE
- TRANSFER SUMP

0 400 800

SCALE IN FEET

ALTERNATIVE 3

GROUNDWATER CONTAINMENT OF CENTER OF PLUME AND ON-SITE TREATMENT/RECHARGE
CROSSLEY FARM
HEREFORD TOWNSHIP, BERKS COUNTY, PA

FIGURE 9

7525gm1

AR302231

pit area and are located within the 10^3 contour boundary which shows the boundaries of the 1000 ug/l concentration.

For the cost estimating purposes it is assumed that a total of 41 wells drilled to depths of 100 to 400 feet would be installed and pumping rates would be approximately 320 gallons per minute ("gpm"). The cost estimate is based on a 30 year period of operation.

Groundwater treatment would be at an on-site plant using an air stripping process to transfer the volatile compounds from the groundwater to a vapor phase which can be captured in an off-gas treatment system. The treated water would be run through an additional carbon polishing unit prior to discharge.

The recharge system for groundwater would be constructed to discharge the water into the shallow and intermediate aquifer by pumping the treated water to specifically constructed trenches in the wooded areas of the farm or into wells screened into the shallow and intermediate water bearing zones.

Institutional controls and monitoring as described in Alternative 2 would also apply to this alternative.

As required by CERCLA, a review of Site conditions would be conducted every five years because contaminants would remain in groundwater beneath the Site.

Capital costs	$ 6,704,932
O & M Costs	$ 2,258,976
Present Worth Costs	*$14,609,180*

Alternative 4- Groundwater Containment of Center of Plume, On-Site treatment and Discharge to the West Branch of the Perkiomen Creek

The groundwater extraction and treatment system proposed in this alternative is identical to alternative 3 except the discharge of the treated groundwater (estimated at 320 gpm) would be through a 2000 foot pipeline constructed from the top of Black Head Hill to a location west of Dale Road as shown in Figure 10

Institutional controls and monitoring as described in Alternative 2 would also apply to this alternative.

As required by CERCLA a review of Site conditions would be conducted every five years because contaminants would remain in groundwater beneath the Site.

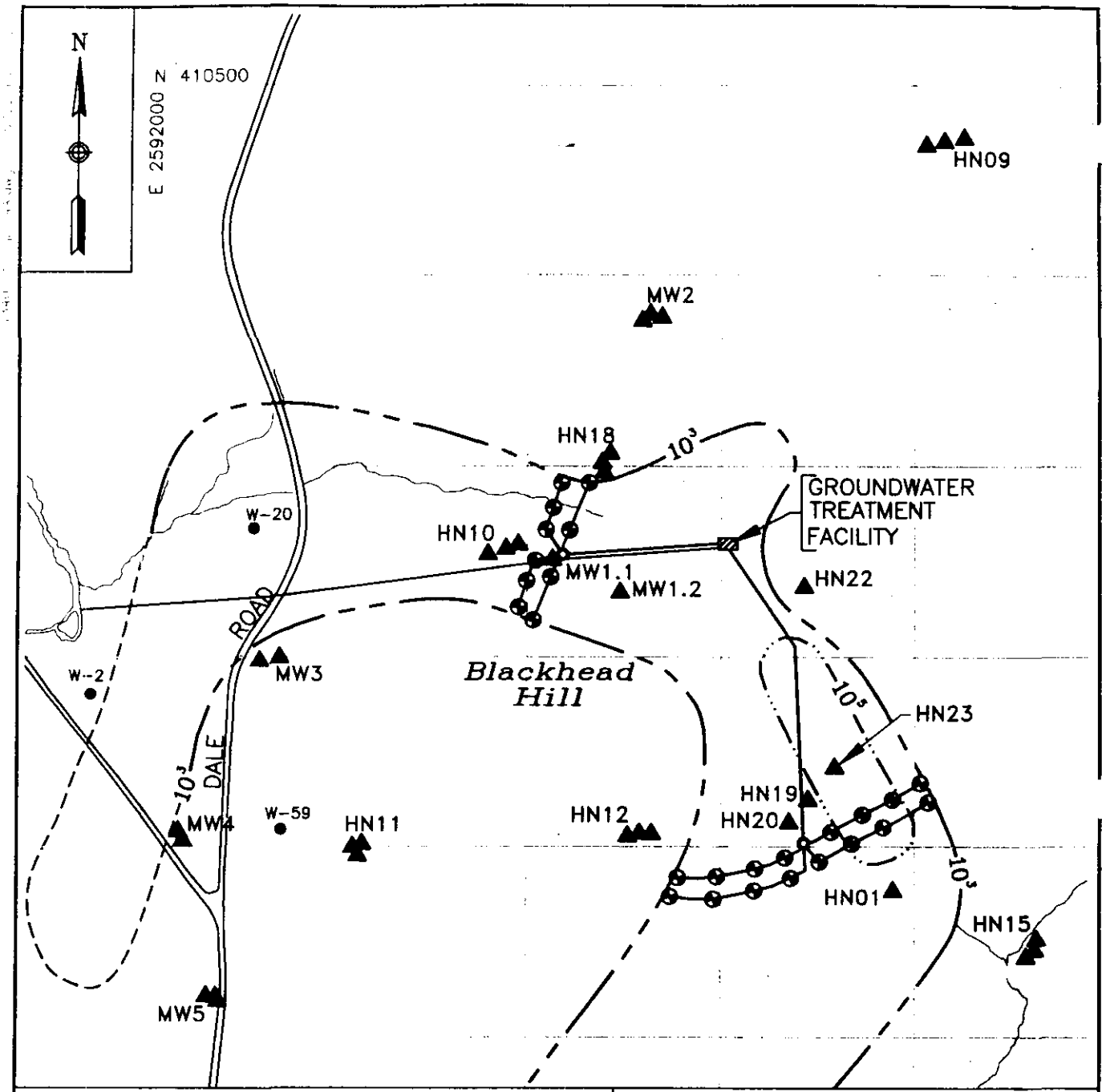
Capital costs	$ 6,339,215
O & M Costs	$ 2,256,429
Present Worth Costs	$14,211,857

Alternative 5 - In-Situ Treatment of the Residual / Hot-Spot Plume

This Remedial Alternative would provide treatment for the highest concentration TCE contamination located immediately downgradient of the borrow pit area using an in-situ treatment of the contaminated groundwater below the surface without extracting the water for above ground treatment.

The area shown in Figure 11 shows the shaded area representing the location of concentration above 10^5or 100,000 ug/l. This is considered the hot-spot plume.

This alternative would require a pre-design investigation and treatability study to evaluate the Fenton's Chemistry oxidation process technology and the air sparging /



NOTES:

1. ISOPLETHS ARE FOR TCE IN THE INTERMEDIATE AQUIFER.
2. THIS IS A PRELIMINARY CONCEPTUAL DESIGN.

LEGEND

- EXTRACTION WELL
- DOUBLE WALL PVC PIPE
- TRANSFER SUMP
- PROPOSED DISCHARGE LINE

0 400 800

SCALE IN FEET

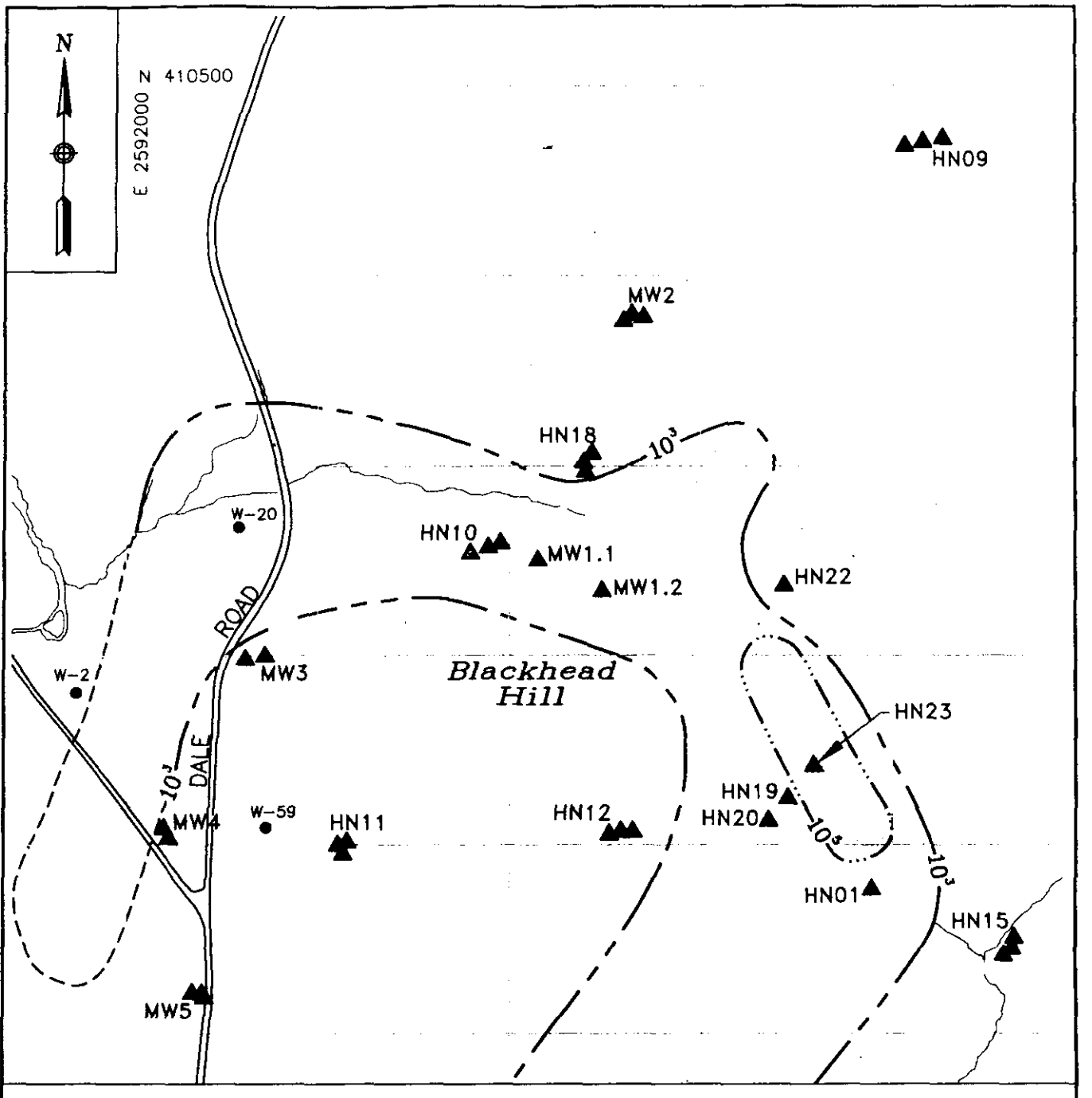
ALTERNATIVE 4

GROUNDWATER CONTAINMENT OF CENTER OF PLUME AND OFF-SITE DISCHARGE
CROSSLEY FARM
HEREFORD TOWNSHIP, BERKS COUNTY, PA

FIGURE 10

7525gm2

AR302233



NOTES:

1. ISOPLETHS ARE FOR TCE IN THE INTERMEDIATE AQUIFER.
2. THIS IS A PRELIMINARY CONCEPTUAL DESIGN.

LEGEND

= PROPOSED AREA FOR IN-SITU TREATMENT

0 400 800

SCALE IN FEET

ALTERNATIVE 5

IN-SITU TREATMENT OF
ON-SITE RESIDUAL/HOT SPOT PLUME
CROSSLEY FARM
HEREFORD TOWNSHIP, BERKS COUNTY, PA

FIGURE 11

7525gm32A.dwg

AR302234

vapor extraction technology.

In-situ chemical oxidation involves the application or injection of a strong oxidizing agent into the contaminated groundwater zone in order to degrade or break down the TCE into less toxic or benign compounds. Fentons Reagent is a solution of hydrogen peroxide and ferrous iron. When injected, the iron acts as a catalyst to create water, carbon dioxide and a diluted hydrochloric acid as byproducts.

Air sparging and vapor extraction injects air into the contaminated groundwater zone and then vacuums the volatile contaminants from the air space above the water table. Both the air injection and the vacuum are applied through a network of wells. The collected vapors are treated prior to discharge to the atmosphere.

For the purpose of this proposed plan it is assumed that in-situ treatment will need between 100 to 150 two inch wells. Additional monitoring wells would be needed to evaluate the effectiveness and breakdown of the TCE into carbon dioxide, oxygen and water.

Institutional controls and monitoring as described in Alternative 2 would also apply to this alternative.

As required by CERCLA a review of Site conditions would be conducted every five years because contaminants would remain in groundwater beneath the Site.

Capital costs	$ 7,593,660
O & M Costs	$ 215900
Present Worth Costs	$ 8,212,634

Alternative 6 - Residual Hot-Spot Plume Pumping and On-Site Treatment

This Remedial Alternative would provide extraction and treatment for the highest concentration TCE contamination located immediately downgradient of the borrow pit area using a limited number of extraction wells in the area represented by concentrations above 10^5 or 100,00 ug/l of TCE.

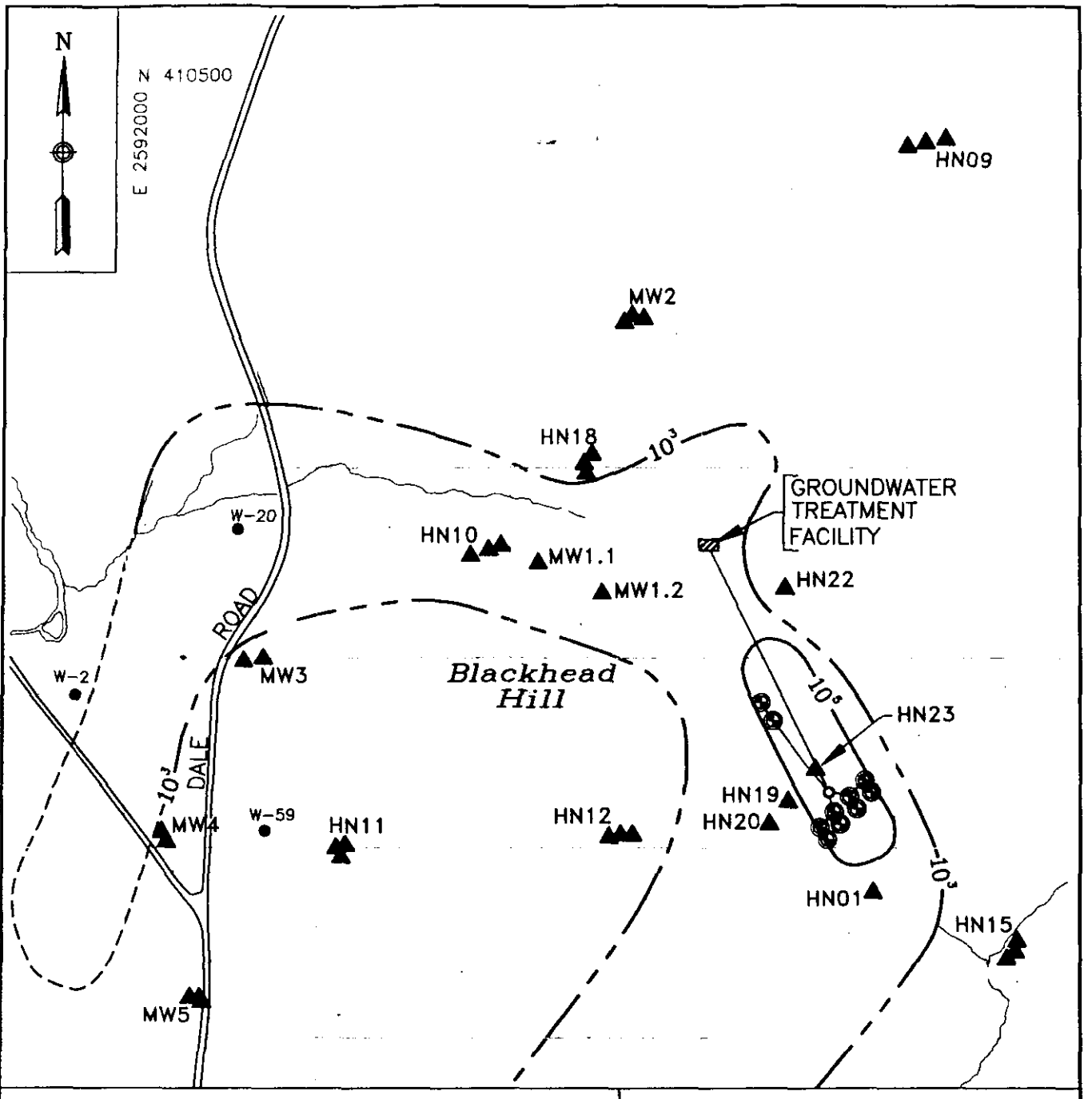
This alternative would require additional groundwater sampling and aquifer characterization to better delineate the vertical and horizontal extent of contamination and to visually determine if the DNAPL exists.

As shown in Figure 12, the FS proposed installation of two wells in the borrow pit area at a depth of approximately 125 and 400 feet. Another 8 wells would be located to the southwest near the existing well HN-23 which contained the highest concentrations of 190,000 ug/l of TCE in the RI sampling. The 10 new wells would be pumped at a total rate of 5 to 30 gpm.

Groundwater treatment would be at an on-site plant using an air stripping process to transfer the volatile compounds from the groundwater to a vapor phase which can be captured in an off-gas treatment system. The treated water would be run through an additional carbon polishing unit prior to discharge.

The recharge system for groundwater would be constructed to discharge the water into the shallow and intermediate aquifer by pumping the treated water to specifically constructed trenches in the wooded areas of the farm or into wells screened into the shallow and intermediate water bearing zones.
Institutional controls and monitoring as described in Alternative 2 would also apply to this alternative.

As required by CERCLA a review of Site conditions would be conducted every five



NOTES:

1. ISOPLETHS ARE FOR TCE IN THE INTERMEDIATE AQUIFER.
2. THIS IS A PRELIMINARY CONCEPTUAL DESIGN.

LEGEND

- EXTRACTION WELL
- DOUBLE WALL PVC PIPE
- TRANSFER SUMP

0 400 800

SCALE IN FEET

ALTERNATIVE 6

RESIDUAL PLUME PUMPING AND ON-SITE TREATMENT/RECHARGE
CROSSLEY FARM
HEREFORD TOWNSHIP, BERKS COUNTY, PA

FIGURE 12

7525gm27A.dwg

years because contaminants would remain in groundwater beneath the Site.

Capital costs	$ 3,607,300
O & M Costs	$ 1,164,872
Present Worth Costs	$ 8,649,466

Alternative 7- Groundwater Containment of Valley Plume, On-Site Treatment and Discharge to West Branch Perkiomen Creek

This alternative would address the plume of TCE contaminated groundwater that extends from the top of Blackhead Hill downgradient to the valley to the West Branch of the Perkiomen Creek and beyond towards the intersection of Dale and Forgedale Roads. The intent of this alternative is to capture and treat the groundwater before it flows into or beneath the Creek.

The conceptual design shown in Figure 13 would place well extraction systems in two separate locations within the area representing the 10^3 concentrations of TCE. One would be located on the west side of Dale Road and the other would be located on the eastern side crossing over Dairy Lane.

Based on preliminary calculations, a total of 22 extraction wells placed at depths up to 400 feet deep would be installed and estimated pumping rates would be about 440 gpm.

The treatment technology would be similar to the air stripping process described in Alternative 3, but each location would have its own treatment system and the treated water would flow through buried pipelines to the Creek.

The groundwater monitoring program would be expanded to include all the valley monitoring wells.

Institutional controls and monitoring as described in Alternative 2 would also apply to this alternative

Capital costs	$ 5,366,997
O & M Costs	$ 223,120
Present Worth Costs	$ 8,627,074

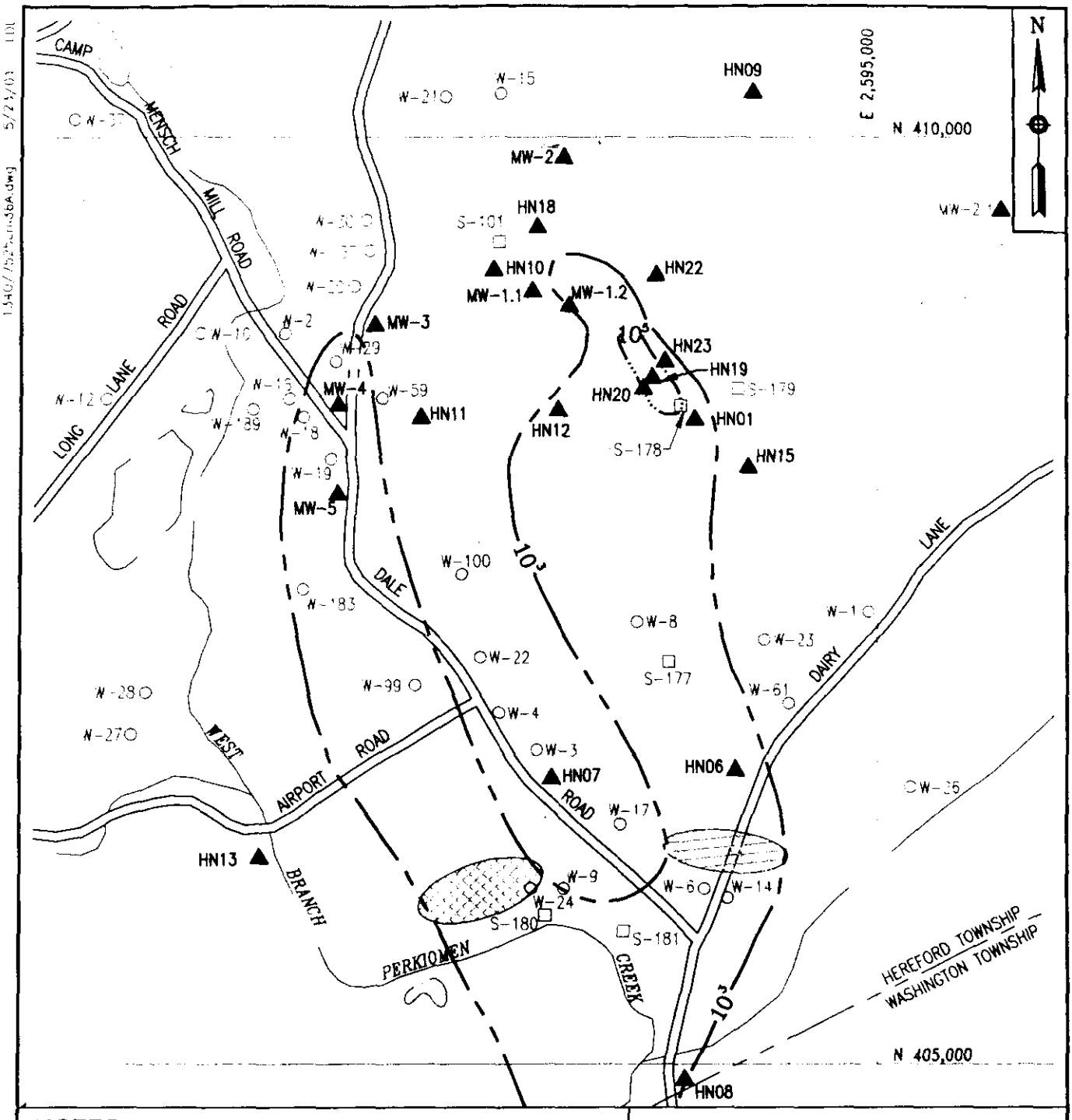
Alternative 8 - In-Situ Treatment of Valley Plume

This alternative would address the same locations , east and west valley plumes, as described in Alterative 7 and shown on Figure 14. However, the treatment process would be similar to the treatment technologies proposed for evaluation in Alternative 5 (in-situ chemical oxidation).

The groundwater monitoring program would be expanded to include all the valley monitoring wells and additional wells to evaluate the effectiveness and breakdown of the TCE into carbon dioxide, oxygen and water.

Institutional controls and monitoring as described in Alternative 2 would also apply to this alternative

Capital costs	$ 8,012,805
O & M Costs	$ 1,437,500
Present Worth Costs	$26,469,716



NOTES:

1. ISOPLETHS ARE FOR TCE IN THE DEEP AQUIFER.
2. THIS IS A PRELIMINARY CONCEPTUAL DESIGN.

LEGEND

= APPROXIMATE LOCATION OF TREATMENT ZONES

0 800 1600

SCALE IN FEET

ALTERNATIVE 7

GROUNDWATER CONTAINMENT OF VALLEY PLUME, ON-SITE TREATMENT AND DISCHARGE TO WEST BRANCH

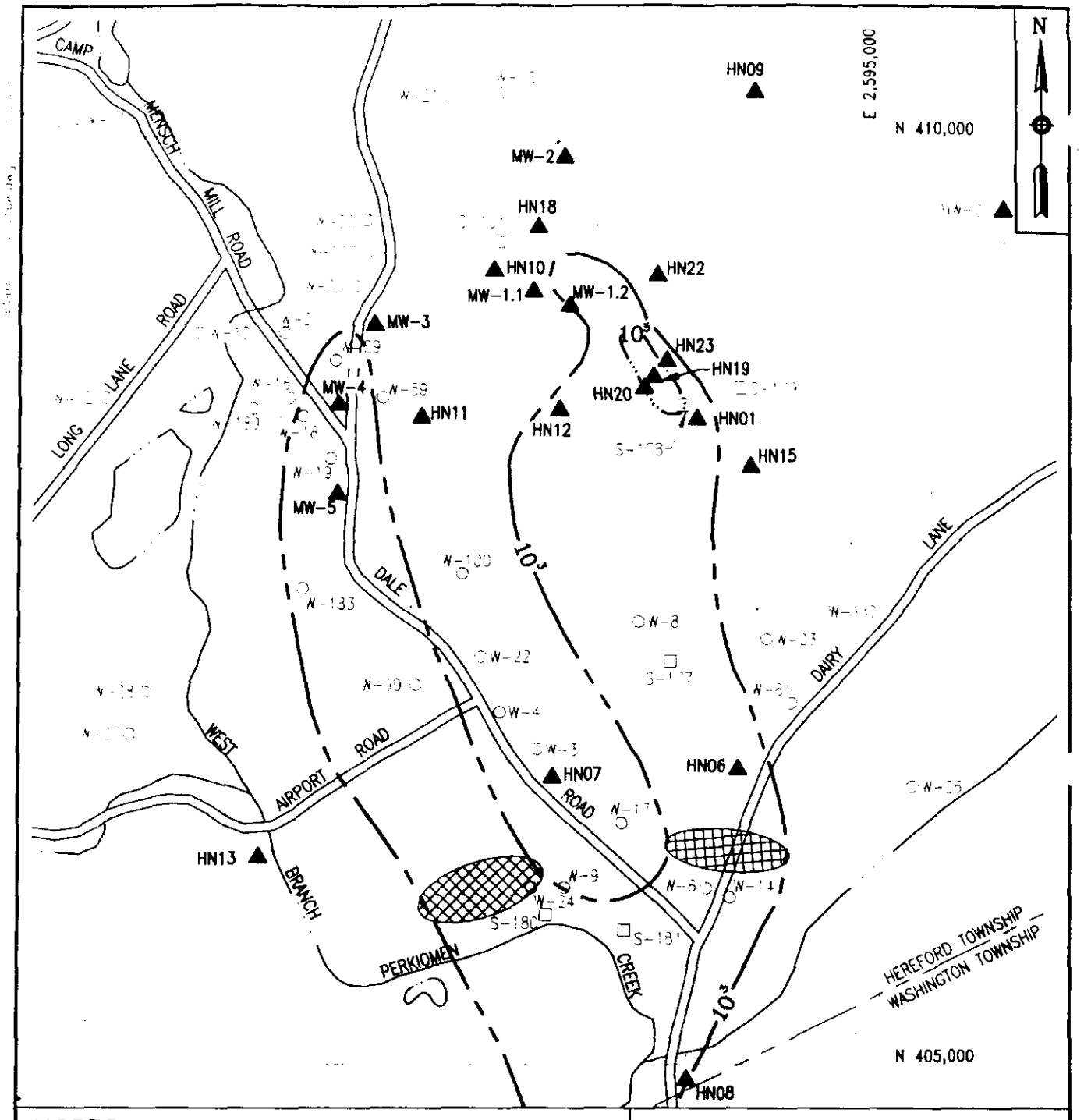
CROSSLEY FARM

HEREFORD TOWNSHIP, BERKS COUNTY, PA

FIGURE 13

1340/7525cm36A.dwg

AR302238



NOTES:

1. ISOPLETHS ARE FOR TCE IN THE DEEP AQUIFER.
2. THIS IS A PRELIMINARY CONCEPTUAL DESIGN.

LEGEND

= APPROXIMATE LOCATION OF TREATMENT ZONES

0 800 1600

SCALE IN FEET

ALTERNATIVE 8

IN-SITU TREATMENT OF VALLEY PLUME
CROSSLEY FARM
HEREFORD TOWNSHIP, BERKS COUNTY, PA

FIGURE 14

1340/75 38A.dwg

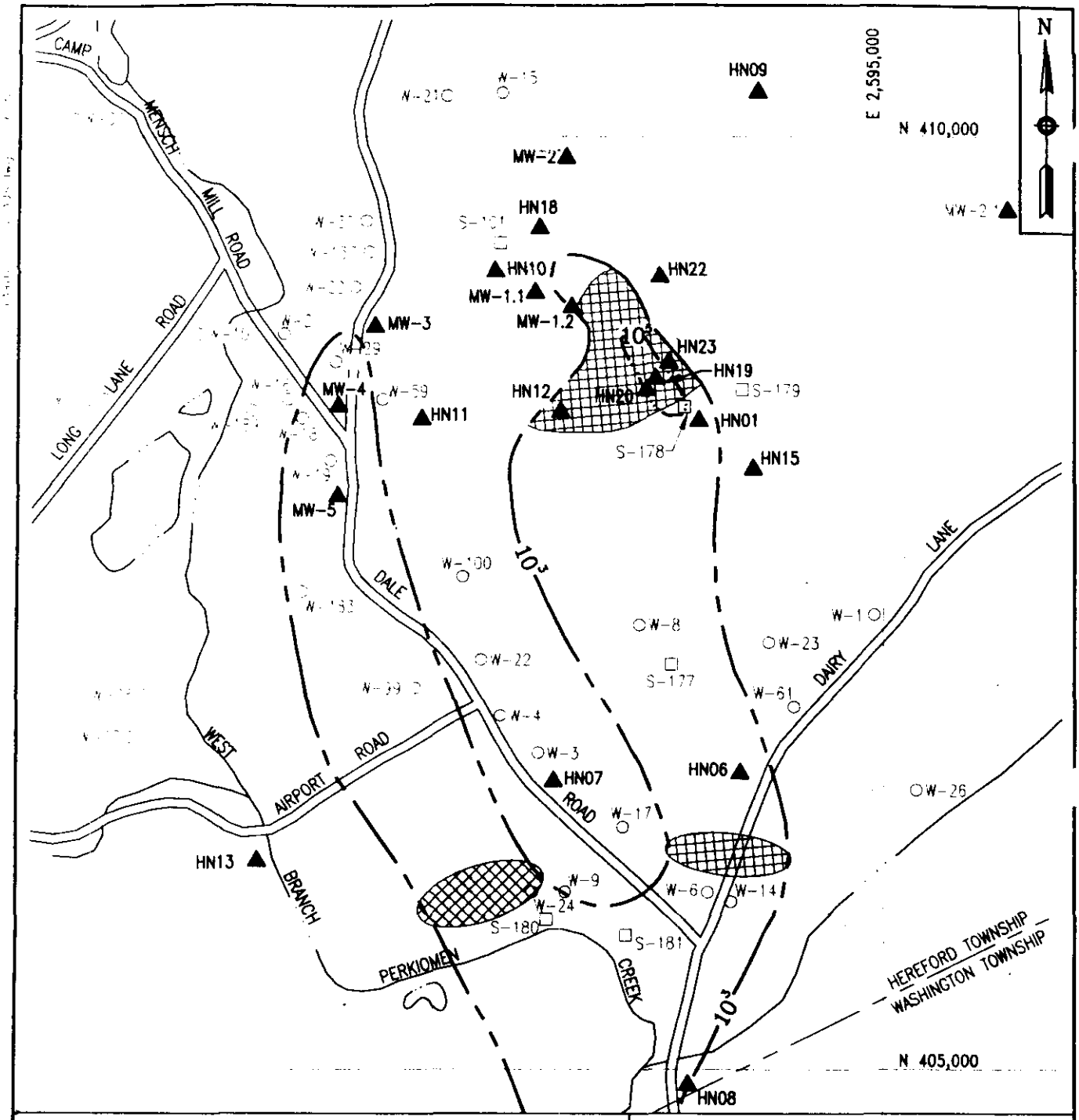
Alternative 9 - Groundwater Containment of Center of Plume and Valley Plume, On-Site Treatment and Discharge to West Branch Perkiomen

This alternative as shown in Figure 15 is the attempt to remediate both the top of the hill center of the plume, including the residual hot spot, and the valley plume. This is the most comprehensive alternative presented in the FS and would be the only alternative which would remediate the 10^3 concentrations of TCE and provide for the potential of natural attenuation for the concentrations less than 1000 ug/l.

It is essentially a combination of Alternative 3 and Alternative 7.

Institutional controls and monitoring as described in Alternative 2 would also apply to this alternative

Capital costs	$10,250,770
O & M Costs	$ 2,256,429
Present Worth Costs	$20,818,415



NOTES:

1. ISOPLETHS ARE FOR TCE IN THE DEEP AQUIFER.
2. THIS IS A PRELIMINARY CONCEPTUAL DESIGN.

LEGEND

= APPROXIMATE LOCATION OF TREATMENT ZONES

0 800 1600

SCALE IN FEET

ALTERNATIVE 9

GROUNDWATER CONTAINMENT OF CENTER AND VALLEY PLUMES

CROSSLEY FARM

HEREFORD TOWNSHIP, BERKS COUNTY, PA

FIGURE 15

m39A.dwg

1340/

AR302241

VI. EVALUATION OF ALTERNATIVES

In selecting EPA's Preferred Alternative EPA evaluates each proposed remedy against the nine criteria specified in the National Contingency Plan ("NCP"). The alternative selected must first satisfy the threshold criteria. Next the primary balancing criteria are used to weigh the tradeoffs or advantages and disadvantages of each of the alternatives. Finally, after public comment has been obtained the modifying criteria are considered.

Below is a summary of the nine criteria used to evaluate the remedial alternatives.

Threshold Criteria:

Overall Protection of Human Health and the Environment:
Whether the remedy provides adequate protection and how risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

Compliance with ARARs:
Whether or not a remedy will meet all applicable or relevant and appropriate requirements (ARARs) of Federal and State environmental statutes and/or whether there are grounds for invoking a waiver. Whether or not the remedy complies with advisories, criteria and/or guidance that may be relevant.

Primary Balancing Criteria

Long-Term Effectiveness and Permanence:
The ability of the remedy to afford long term, effective and permanent protection to human health and the environment along with the degree of certainty that the alternative will prove successful.

Reduction of Toxicity, Mobility or Volume:
The extent to which the alternative will reduce the toxicity, mobility, or volume of the contaminants causing the site risks.

Short Term Effectiveness:
The time until protection is achieved and the short term risk or impact to the community, onsite workers and the environment that may be posed during the construction and implementation of the alternative.

Implementability:
The technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement that remedy.

Cost:
Includes estimated capital, operation and maintenance (O&M), and net present worth costs.

Modifying Criteria

State Acceptance:
Whether the State concurs with, opposes, or has no comment on the Preferred Remedial Alternative.

The Commonwealth of Pennsylvania Department of Environmental Protection agrees with the Preferred Alternative which will implement a limited extraction and treatment groundwater remediation, but will withhold concurrence until final review of the ROD.

The flexibility to expand the system to capture the groundwater plume moving down the west side of Blackhead Hill is an important concern for PADEP because the surface springs are contributing to the West Branch of the Perkiomen Creek where TCE concentrations exceed water quality criteria for human health.

Community Acceptance:
Whether the public agrees with the Preferred Remedial Alternative (this will be assessed in the Record of Decision following a review of the public comments received on the Proposed Plan and the Administrative Record).

Community acceptance of the Preferred Alternative will be evaluated after the public comment period ends, and will be described in the Responsiveness Summary contained in the ROD.

The following tables address the threshold criteria and the primary balancing criteria. The narrative analysis of the criteria is in the Feasibility Study for the Site. The modifying criteria will be addressed in the ROD for the groundwater interim remedy.

TABLE ROD - 1
COMPARATIVE ANALYSIS OF GROUNDWATER ALTERNATIVES
FEASIBILITY STUDY
CROSSLEY FARM SITE, HEREFORD TOWNSHIP, BERKS COUNTY, PA

ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 INSTITUTIONAL CONTROLS AND MONITORING	ALTERNATIVE 3 CONTAIN, TREAT AND ON-SITE RECHARGE	ALTERNATIVE 4 CONTAIN, TREAT AND OFF-SITE RECHARGE	ALTERNATIVE 5 IN-SITU TREATMENT OF RESIDUAL/HOT SPOT PLUME	ALTERNATIVE 6 RESIDUAL/HOT SPOT PLUME PUMP AND TREAT, ON-SITE RECHARGE	ALTERNATIVE 7 GROUNDWATER CONTAINMENT OF VALLEY PLUME, ON-SITE TREAT AND OFF-SITE DISCHARGE	ALTERNATIVE 8 IN-SITU TREATMENT OF VALLEY PLUME	ALTERNATIVE 9 CONTAINMENT OF CENTER OF PLUME AND VALLEY PLUME, TREAT AND OFF-SITE DISCHARGE
OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT								
Provides no additional protection against human exposure to contaminated groundwater. Carcinogenic and non-carcinogenic risks exceeding EPA's target risk range would remain. No institutional controls to restrict use of untreated contaminated site groundwater . No actions taken to reduce contaminant migration.	Institutional controls would minimize potential exposure to site groundwater by prohibiting its use as drinking water. Groundwater monitoring would provide information regarding extent and concentration of contaminant plumes. No additional protection provided to environmental receptors.	Over time will prevent exposure to TCE concentrations greater than 1,000 ug/l downgradient of site. Institutional controls would minimize potential exposure to site groundwater. Monitoring would provide information regarding performance of remedial alternative and extent of untreated portion of site plume.	Same as Alternative 3.	Provides in-situ treatment of possible DNAPL source area. Natural degradation may reduce downgradient groundwater contaminant concentrations on-site and off-site, though over an extended period of time. Institutional controls and monitoring same as Alternative 3.	Provides collection and ex-situ treatment of possible DNAPL source area. Treated water would be returned on-site. Natural degradation may reduce groundwater contaminant concentrations on-site and off-site, though over an extended time period. Institutional controls and monitoring same as Alternative 3.	Would provide limited protection as majority of on-site and off-site plumes would not be contained and/or treated. Would provide collection and treatment of a portion of valley plume. Institutional controls and monitoring same as Alternative 3.	Same as Alternative 7, however treatment may not reduce contaminant levels to below MCLs.	Would provide higher level of protection as groundwater contaminated with TCE >1,000 ug/l on Blackhead Hill and in Dale Valley would be captured and treated. Institutional controls and monitoring same as Alternative 3.

ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 INSTITUTIONAL CONTROLS AND MONITORING	ALTERNATIVE 3 CONTAIN, TREAT AND ON-SITE RECHARGE	ALTERNATIVE 4 CONTAIN, TREAT AND OFF-SITE RECHARGE	ALTERNATIVE 5 IN-SITU TREATMENT OF RESIDUAL/HOT SPOT PLUME	ALTERNATIVE 6 RESIDUAL/HOT SPOT PLUME PUMP AND TREAT, ON-SITE RECHARGE	ALTERNATIVE 7 GROUNDWATER CONTAINMENT OF VALLEY PLUME, ON-SITE TREAT AND OFF-SITE DISCHARGE	ALTERNATIVE 8 IN-SITU TREATMENT OF VALLEY PLUME	ALTERNATIVE 9 CONTAINMENT OF CENTER OF PLUME AND VALLEY PLUME, TREAT AND OFF-SITE DISCHARGE
COMPLIANCE WITH ARARs AND TBCs								
Would not comply with state groundwater quality standards or statutory requirements.	Monitoring activities would comply with appropriate federal and state requirements.	Implementation of this alternative would result in containment and treatment of TCE dissolved plume of 1,000 ug/l or greater concentration. Treatment would achieve ARAR for captured groundwater, only. On-site and off-site TCE plumes less than 1,000 ug/l would not comply, though over extended time period concentrations should decrease.	Same as Alternative 3.	Dissolved plume would not comply; over time residual source would be removed; dissolved plume concentrations should decrease.	Same as Alternative 5. Extent of untreated portion of site plume would not be in immediate compliance.	On-site dissolved and residual groundwater plume concentrations would not be in compliance. Groundwater downgradient of valley treatment zone should comply over time.	Same as Alternative 7.	Would result in containment and treatment of TCE plume >1,000 ug/l. Lower concentration plumes should comply over time.
REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT								
No reduction of toxicity, mobility, or volume, since no treatment would be employed.	Same as Alternative 1.	The groundwater extraction and treatment system would capture a portion of the dissolved plume and remove the VOCs to reduce the toxicity, mobility and volume of contaminated groundwater. The number of years of treatment to reduce on-site levels below ARARs is unknown. Treatment process is irreversible.	Same as Alternative 3.	The toxicity and volume of untreated groundwater within the residual zone would be reduced through implementation of Alternative 5. The degree of reduction is unknown. Treatment process is irreversible.	Same as Alternatives 5.	The toxicity and volume of groundwater within the valley plume would be reduced. Preliminary design would treat 2,400 gpm. Mobility of plume not affected. Treatment process is irreversible.	Same as Alternative 7.	Same as Alternative 3 and 7.

ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 INSTITUTIONAL CONTROLS AND MONITORING	ALTERNATIVE 3 CONTAIN, TREAT AND ON-SITE RECHARGE	ALTERNATIVE 4 CONTAIN, TREAT AND OFF-SITE RECHARGE	ALTERNATIVE 5 IN-SITU TREATMENT OF RESIDUAL/HOT SPOT PLUME	ALTERNATIVE 6 RESIDUAL/HOT SPOT PLUME PUMP AND TREAT, ON-SITE RECHARGE	ALTERNATIVE 7 GROUNDWATER CONTAINMENT OF VALLEY PLUME, ON-SITE TREAT AND OFF-SITE DISCHARGE	ALTERNATIVE 8 IN-SITU TREATMENT OF VALLEY PLUME	ALTERNATIVE 9 CONTAINMENT OF CENTER OF PLUME AND VALLEY PLUME, TREAT AND OFF-SITE DISCHARGE
LONG-TERM EFFECTIVENESS AND PERMANENCE								
Existing risks would remain. Five-year reviews would be required since groundwater contaminants would be left in place.	Implementation and enforcement of institutional controls would reduce risks from exposure to on-site groundwater. Risks to off-site untreated groundwater would remain. Five-year reviews would be required since groundwater contaminants would be left in place.	Over an extended period, until groundwater remediation goals are achieved and natural degradation reduces untreated portion of plume, implementation and enforcement of institutional controls would reduce risks from exposure to a portion of the groundwater plume. Technologies are widely used and effective for remediation of VOC contaminated groundwater. Five-year reviews would be required as a portion of the plume would not be treated.	Same as Alternative 3.	Over time, risk at site would decrease as source of contamination would be removed; however dissolved plume not treated. Relatively new treatment process, may not be adequate for extent of DNAPL source area and contaminant levels; has had limited field applications. Five-year reviews would be required as portion of plume would not be treated.	Same as Alternative 3.	Risk at site would remain the same; risk downgradient of treatment zone would be reduced. Groundwater extraction and air stripping are widely used effective technologies for the remediation of VOC contaminated groundwater. Five-year reviews would be required as portion of plume would not be treated.	Relatively new treatment process, has had limited field applications. Adequacy of treatment is dependent upon effectiveness of reagent versus contaminant levels and geology of treatment area. Five-year reviews would be required as a portion of plume would not be remediated.	Same as Alternative 3.

ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 INSTITUTIONAL CONTROLS AND MONITORING	ALTERNATIVE 3 CONTAIN, TREAT AND ON-SITE RECHARGE	ALTERNATIVE 4 CONTAIN, TREAT AND OFF-SITE RECHARGE	ALTERNATIVE 5 IN-SITU TREATMENT OF RESIDUAL/HOT SPOT PLUME	ALTERNATIVE 6 RESIDUAL/HOT SPOT PLUME PUMP AND TREAT, ON-SITE RECHARGE	ALTERNATIVE 7 GROUNDWATER CONTAINMENT OF VALLEY PLUME, ON-SITE TREAT AND OFF-SITE DISCHARGE	ALTERNATIVE 8 IN-SITU TREATMENT OF VALLEY PLUME	ALTERNATIVE 9 CONTAINMENT OF CENTER OF PLUME AND VALLEY PLUME, TREAT AND OFF-SITE DISCHARGE
SHORT-TERM EFFECTIVENESS								
No risk to community, workers, or environment anticipated.	No significant risk to community or workers anticipated. No additional environmental impacts anticipated as remedial measures consist of institutional controls and monitoring. Would not meet RAO for preventing migration of contaminated groundwater.	No significant risk to community or environment is anticipated. Site-specific HASP would be developed and implemented for worker protection. Will result in portion of plume being contained and treated; untreated portion would continue to migrate from site. Duration of treatment unknown.	Same as Alternative 3.	Risk to community should be minimal, however, additional information on bedrock fracture network and treatment process chemistry required. Site-specific HASP would be developed and implemented for worker protection. Need to identify engineering controls required to minimize environmental effects. Duration of treatment is unknown. Untreated portion of plume would continue to migrate from site.	No significant risk to community or environment anticipated. Site-specific HASP would be developed and implemented for worker protection. Would not achieve RAO for preventing migration of contaminated groundwater as only a portion of the plume would be treated. Need to quantify source mass to determine duration of treatment.	Same as Alternative 3. Addresses a portion of the valley plume; does not address migration of site plume or source removal.	Risk to community should be minimal, however, additional information on aquifer characteristics, bedrock fracture network, and treatment process chemistry required prior to implementation. Site-specific HASP would be developed and implemented for worker protection during construction, operation, and monitoring.	Same as Alternative 3.
IMPLEMENTABILITY								
No construction or operation involved.	Same as Alternative 1.	Common well construction techniques and equipment used for installation of extraction and containment system. Modular treatment system would be easily constructed. Recharge system installation/operation may be difficult due to site topography, land access and geology.	Common well construction techniques and equipment used for installation of extraction and containment system. Modular treatment system would be easily constructed. Installation and construction of off-site treated water discharge line will require access to private properties.	More difficult to construct and operate than Alternative 6; large number of wells required to inject treatment materials.	Common construction techniques and equipment used for installation of extraction and containment system. Modular treatment system would be easily constructed. Recharge system installation may be difficult operation due to site topography, land access and geology.	Common construction techniques and equipment used for installation of extraction and containment system. Modular treatment system would be easily constructed. Installation and construction of treatment system and discharge line will require access to private properties.	More difficult to construct and operate than Alternative 7, large number of wells required for injection of treatment materials. Installation and construction of treatment system will require access to private properties.	Same as Alternative 4 and 7.

	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 INSTITUTIONAL CONTROLS AND MONITORING	ALTERNATIVE 3 CONTAIN, TREAT AND ON-SITE RECHARGE	ALTERNATIVE 4 CONTAIN, TREAT AND OFF-SITE RECHARGE	ALTERNATIVE 5 IN-SITU TREATMENT OF RESIDUAL/HOT SPOT PLUME	ALTERNATIVE 6 RESIDUAL/HOT SPOT PLUME PUMP AND TREAT, ON-SITE RECHARGE	ALTERNATIVE 7 GROUNDWATER CONTAINMENT OF VALLEY PLUME, ON-SITE TREAT AND OFF-SITE DISCHARGE	ALTERNATIVE 8 IN-SITU TREATMENT OF VALLEY PLUME	ALTERNATIVE 9 CONTAINMENT OF CENTER OF PLUME AND VALLEY PLUME, TREAT AND OFF-SITE DISCHARGE
COST									
Capital Cost ($)	$0	$16,074	$6,704,932	$6,339,215	$7,593,660	$3,607,300	$5,366,997	$8,012,805	$10,250,770
First Year Annual O&M Cost ($)	$0	$21,900	$2,258,976	$2,256,429	$21,900	$1,164,872	$223,120	$1,437,500	$2,256,429
Present Worth Cost ($)	$0	$581,148	$14,609,180	$14,211,857	$8,212,634	$8,649,466	$8,627,074	$26,469,716	$20,818,415

EPA'S PREFERRED ALTERNATIVE:

Based on the Evaluation of Alternatives, the EPA Preferred Alternative is Alternative 6 with some clarifications

Residual Hot-Spot Plume Pumping and On-Site Treatment

The preferred alternative is to implement a limited groundwater treatment remedial action for the highest concentration of contamination at the top of Blackhead Hill. --. By using a limited number of extraction wells in the "hot spot", the Agency can evaluate the effectiveness of a few wells to decrease concentrations in the groundwater and in the springs down the hill and in the valley. This approach will allow for expansion of the extraction and treatment system as EPA considers which other remedial actions to select in future decision documents for the Site The expansion could be similar to and include other alternatives described in this plan attempt to contain the contamination at the top of the hill (Alternatives 3 &4) and possibly locate additional groundwater treatment systems downgradient in the valley (Alternatives 7 & 9). In-situ chemical oxidation (Alternatives 5 & 8) was not selected because of the uncertainty with using a relatively new treatment technology in a fractured bedrock setting this close to residential wells. The No Action Alternative 1 was not selected because it would not meet the remedial action objectives. The Institutional Controls Alternative 2 is included in the preferred alternative.

This Remedial Alternative will provide treatment of the highest concentration of TCE contamination located immediately downgradient of the borrow pit area using a limited number of extraction wells in the area represented by concentrations above 10^5 or 100,000 ug/l of TCE.

This alternative will require additional groundwater sampling to better delineate the vertical and horizontal extent of contamination and to visually determine if the DNAPL exists.

As shown in Figure 12, this alternative proposes installation of two wells in the borrow pit area at a depth of approximately 125 and 400 feet. Another 8 wells will be located to the southwest near well HN-23 which contained the highest concentrations of 190,000 ug/l of TCE in the RI sampling. The 10 new wells will be pumped at a rate of 5 to 30 gpm.

Groundwater treatment will be at an on-site plant using an air stripping process to transfer the volatile compounds from the groundwater to a vapor phase which can be captured in an off-gas treatment system. The treated water will be run through an additional carbon polishing unit prior to discharge.

The recharge system for groundwater would be constructed to discharge the water into the shallow and intermediate aquifer by pumping the treated water to specifically constructed trenches in the wooded areas of the farm or into wells screened into the shallow and intermediate water bearing zones.

This proposed remedial action will require some property on the farm at the top of the hill for long term use to house the equipment for the extraction and treatment remedy as well as for the groundwater recharge system. It will be further determined in a remedial design, but one or two acres of the farm is anticipated to be needed for the essential aspect of the remedial work.

The institutional controls would be to monitor the groundwater and restrict the use of contaminated groundwater at the Site.

Groundwater extraction wells shall not be installed and contaminated groundwater at the Crossley Farm Superfund Site, including but not limited to the areas of Huff's Church Road, Dale Road, Forgedale Road, Dairy Lane, Airport Road and Camp Mench Mill Road shall not be used unless treatment units are installed and maintained to ensure that any water used has contaminant levels at or below MCLs. This could be achieved with local government restrictions on the use of groundwater.

Because the June 1997 ROD is now complete, as discussed above, any new property construction over the contaminated groundwater plume after February 2001 would not receive carbon filtration units paid for by EPA.

Groundwater monitoring under this alternative would be a remedial action. Sampling of residential wells and springs would be conducted every 6 months.

As required by CERCLA, a review of Site conditions would be conducted every five years because contaminants would remain in groundwater beneath the Site.

Based on the information currently available, the lead agency believes the Preferred Alternative meets the threshold criteria with the a goal of meeting EPA' Drinking Water Standards as shown on Table 2 and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The EPA expects the Preferred Alternative in conjunction with the previous actions taken by EPA and PADEP to satisfy the following statutory requirements of CERCLA Section 121(b): (1) be protective of human health and the environment, (2) be cost effective, and (3) satisfy preference for treatment as a principal element. This interim remedy is not required to meet ARARS because it is not the final remedy decision. The final and permanent remedy decision in regard to the regional groundwater remediation shall be made by EPA in a separate decision document following the evaluation of the interim remedy.

TABLE 2

Groundwater Remediation Goals

cis-1,2-Dichloroethylene	0.07 mg/l
Tetrachloroethylene	0.005 mg/l
Trichloroethylene	0.005 mg/l

VII. COMMUNITY ROLE IN SELECTION PROCESS

This Proposed Plan is being distributed to solicit public comment regarding the proposed remedial alternative for cleaning up the Site. EPA relies on public input so that the remedy selected for each Superfund site meets the needs and concerns of the local community. To assure that the community's concerns are being addressed, a public comment period lasting thirty (30) calendar days will follow this public notice and a public meeting will be held in the community. It is important to note that although EPA has proposed a Preferred Alternative, the final remedy selection for this aspect of the Site has not been made. All comments received will be considered and addressed by EPA before a final remedy selection is made.

Detailed information on the material discussed herein may be found in the Administrative Record for the Site, which contains the Remedial Investigation, Risk Assessment, and Feasibility Study Reports and other information used by EPA in the decision-making process. EPA encourages the public to review the Administrative Record in order to gain a more comprehensive understanding of the

Site and Superfund activities that have been conducted there.

Copies of the Administrative Record are available for review at the following

Information Repositories:

U.S. EPA Region III
1650 Arch Street, 6th Floor
Philadelphia, PA 19102
Attn: Anna Butch (3HS11)
(215) 814-3157

Hereford Township Municipal Building
3131 Seidholtzville Road
Macungie, PA 18056
610 845-2929

Washington Township Municipal Building
120 Barto Road
Barto, PA 19504
610 845-7760

Public Comment Period

The public comment period will run from July 23, 2001 to August 22, 2001 Written comments, questions and requests for information can be sent to:

Mr. Roy Schrock (3HS22)
Remedial Project Manager
U.S. Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, PA 19102
(215) 814-3210
schrock.roy@epa.gov

Public Meeting

Arrangements have been made for a public meeting to be held on **August 7, 2001** at the Washington Township Elementary School, Route 100, Barto Pennsylvania 19504

Questions regarding the public meeting should be directed to:

Ms. Lisa Brown
Community Involvement Coordinator
U.S. Environmental Protection Agency
Region III
(215)814-5528
brown.lisa@epa.gov

Following the conclusion of the thirty (30) calendar day public comment period on this proposed plan, a Responsiveness Summary will be prepared. The Responsiveness Summary will summarize and respond to citizens' comments on EPA's Preferred Remedial Alternative and the rest of the alternatives too. EPA will then prepare a formal decision document, the Record of Decision (ROD), that summarizes the decision process and the remedy selected for the Site. This ROD will include the Responsiveness Summary. Copies of the ROD will be made available for public review in the information repositories. Once the formal decision document is approved, EPA will invite the parties responsible for contamination at the Site to participate in the implementation of remedial design and remedial action for the Site.

GLOSSARY

Administrative Record - EPA's official compilation of documents, data, reports, and other information that is considered important to the status of, and decisions made, relative to a Superfund site. The record is placed in the information repositories to allow public access to the material.

ARARs - Applicable, Relevant and Appropriate Requirements:

Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA Site.

Relevant and Appropriate requirements are those same standards mentioned above that while not "applicable" at the CERCLA site, address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the particular site.

Bioconcentration Factor - BCF provides a measure of the extent of chemical partitioning between a biological medium such as fish tissue or plant tissue and an external medium such as water. The higher the BCF, the greater the accumulation in living tissue is likely to be.

Capping - Construction of a protective cover over areas containing wastes or contamination. Caps prevent surface exposure of the wastes and reduce or eliminate infiltration of rain water or other precipitation into the waste. This minimizes the movement of contaminants from the site through ground water, surface water, or leachate.

Carcinogenic - Cancer-causing agent.

CFR - The Code of Federal Regulations. For example, the citation 40 CFR 260 means Title 40 of the Code of Federal Regulations, Part 260.

DQO - Data Quality Objectives are qualitative and quantitative statements specifying the required quality of the data for each specific use. DQOs are based on the concept that different data uses often require data of varying quality. An example of different data uses for the RI/FS include site characterization, risk assessment, and alternatives evaluation

Groundwater - Water found beneath the earth's surface that fills pores between soil, sand, and gravel particles to the point of saturation. Groundwater often flows more slowly than surface water. When it occurs in sufficient quantity, groundwater can be used as a water supply.

Hazard Index - The sum of more than one hazard quotient for multiple substances and/or multiple exposure pathways.

Information Repository - A location where documents and data related to the Superfund project are placed by EPA to allow the public access to the material.

Leachate -The contaminated liquid resulting from water percolating through a landfill or other waste disposal facility.

MCLs - or Maximum Contaminant Levels are primary standards developed by EPA to protect human health. These standards are enforceable and apply to specific contaminants that EPA has determined have an adverse effect on human health.

National Contingency Plan (NCP) - The Federal regulation at 40 CFR, Part 300 that guides the determination and manner in which sites will be cleaned up under the Superfund program.

National Priorities List (NPL) - EPA's list of the nation's top priority hazardous waste sites that are eligible to receive federal money for response action under Superfund.

NPDES -National Pollutant Discharge Elimination System program is the national program for issuing, monitoring, and enforcing permits for direct discharges. The NPDES program is implemented under 40 CFR Parts 122-125. The NPDES permits contain applicable effluent standards, monitoring requirements, and standard and special conditions for discharge. The NPDES program is administered by EPA and by State agencies authorized by EPA to administer a State program equivalent to the Federal NPDES program.

O & M - Operation and Maintenance

Organic Compounds - Chemicals containing carbon are classified as organic. Many hundreds of thousands are known. At the Site the chemicals present are organics. Some organic compounds can cause cancer.

Plume - The three dimensional area of contamination in a particular media, such as groundwater. A plume can expand due to groundwater movement.

ppb - Parts per Billion. Five parts per billion is a fractional representation of 5 parts in 1 billion parts. For solids, ppb is a fraction based on weight, for example 5 pounds of a contaminant in a billion pounds (500,000 tons) of soil. For liquids ppb is based on volume, for example 5 tablespoons of a contaminant in a billion tablespoons (3,906,250 gallons) of water.

ppm - Parts per Million. Five ppm is a fractional representation of 5 parts in 1 million.

RCRA (Resource Conservation and Recovery Act) - A statute at 42 U.S.C. §§ 6901 et. seq. under which EPA regulates the management of hazardous waste.

Record of Decision (ROD) - A legal decision

document that describes the remedial actions selected for a Superfund site, why certain remedial actions were chosen as opposed to others, how much they will cost, and how the public responded and how the public's comments about the Proposed Plan were incorporated into the final decision.

Remedial Investigation and Feasibility Study (RI/FS) - A report composed of two scientific studies, the RI and the FS. The RI is the study to determine the nature and extent of contaminants present at a Site and the problems caused by their release. The FS is conducted to develop and evaluate options for the cleanup of a Site.

Risk Assessment (RA) - The RA is an essential component of the Remedial Investigation Report. This portion of the RI evaluates the carcinogenic and non-carcinogenic risks presented by the contaminants at the site. Risk is calculated both for current uses and potential future uses of the property by a defined population, i.e., on and offsite residents, trespassers, etc.

Scientific Notation - In dealing with particularly large or small numbers, scientists and engineers have developed a "short hand" means of expressing these numeric values based on their value in a base 10 system. For example, 1,000,000 can be written as 1E06 and 1/1,000,000 can be written as 1E-06 .

SUPERFUND (Comprehensive Environmental Response Compensation and Liability Act - Common name for the Federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act codified at 42 U.S.C. §§ 9601 et. seq. The Act created a Trust Fund, known as Superfund, which is available to EPA to investigate and clean up abandoned or uncontrolled hazardous waste sites.

Volatile Organic Compounds (VOCs) - Chemical compounds containing carbon that readily volatilize or evaporate when exposed to the air. These compounds are commonly used as solvents.